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CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 16 | Published by the MacLean Publishing Company, Limited, Toronto | April 21, 1921 | $4.00 a Year Subscription Price

READ AND PASS TO	check	See Page	READ AND PASS TO	check	See Page	READ AND PASS TO	check	See Page
							For	File

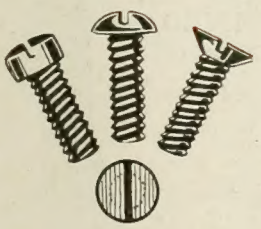
Now Made in Canada

Torrington MACHINE SCREWS

Announcement

ANOTHER large firm from across the border has established a branch in Canada to meet a growing demand for their products.

The makers of the well-known **Torrington** Machine Screws have opened a plant at Upper Bedford, Quebec. The demand for **Torrington** Machine Screws in Canada has been established strictly on the uniformity and superior workmanship of the product, and the plant at Upper Bedford has provided adequate means to produce Made-in-Canada **Torrington** Machine Screws equal in every particular to the screws which have hitherto been supplied to Canadian Buyers from the plant at Torrington, Conn.



When you buy **Torrington** products you can secure screws that are made to standard dimension; this enables the user to provide correct style and make tops which will insure uniform fits.

In addition to the standard line, Torrington Machine Screws are manufactured in special sizes and styles.

All you have to do to be convinced of the quality of Torrington products is to write for samples.

THE TORRINGTON COMPANY, LIMITED

UPPER BEDFORD, QUEBEC

STAYBOLT TAPS

The Better the Man the More He Appreciates Them---

Not only good when new, but heat treated and seasoned to maintain this goodness. Can be ground on face of cutting edge without affecting their size. That's why you'll find Pratt and Whitney Stay Bolt Taps on the job long after cheaper, "just as good" tools are buried in the scrap pile.

Threads accurately and cleanly cut, with the least expenditure of time and effort, are other reasons why these better Taps are favorites in the shop.

If you've used them before, you know just how good they are. If you haven't, send us your first order—we know you'll be back for more. They're carried in stock in our sales rooms in all large cities.

PRATT & WHITNEY CO.
OF CANADA LIMITED
Works: DUNDAS, Ontario

MONTREAL
723 Drummond Bldg.
TORONTO
1002 C.P.R. Bldg.
WINNIPEG
1205 McArthur Bldg.
WINDSOR
Davis Building.
HALIFAX
Roy Building.
VANCOUVER
B.C. Equipment Co.

PRATT AND WHITNEY

The BERTRAM Page

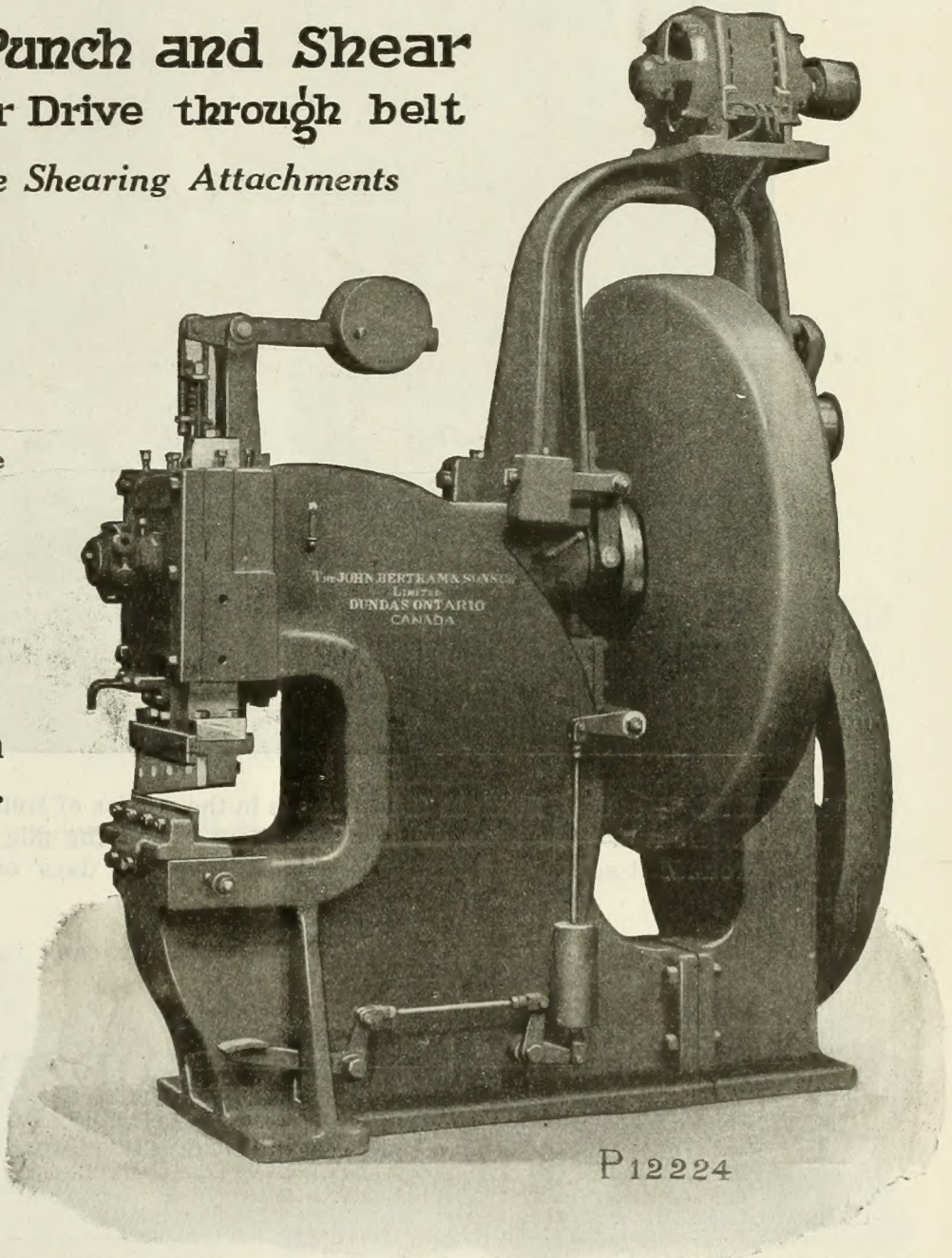
MACHINE TOOLS

JB&SCO

No.4 Single Punch and Shear

12" Throat Motor Drive through belt

Fitted with Plate Shearing Attachments



Capacity

To punch 1" hole through 1" Plate
To shear 1" Plates
To " 6"x1" Flat Bars
To " 1¾" Round Bars
To " 4x4x⅜" Angles

The John Bertram & Sons Co., Ltd.
DUNDAS ONTARIO

MONTREAL
723 Drummond Bldg.

TORONTO
1002 C.P.R. Bldg.

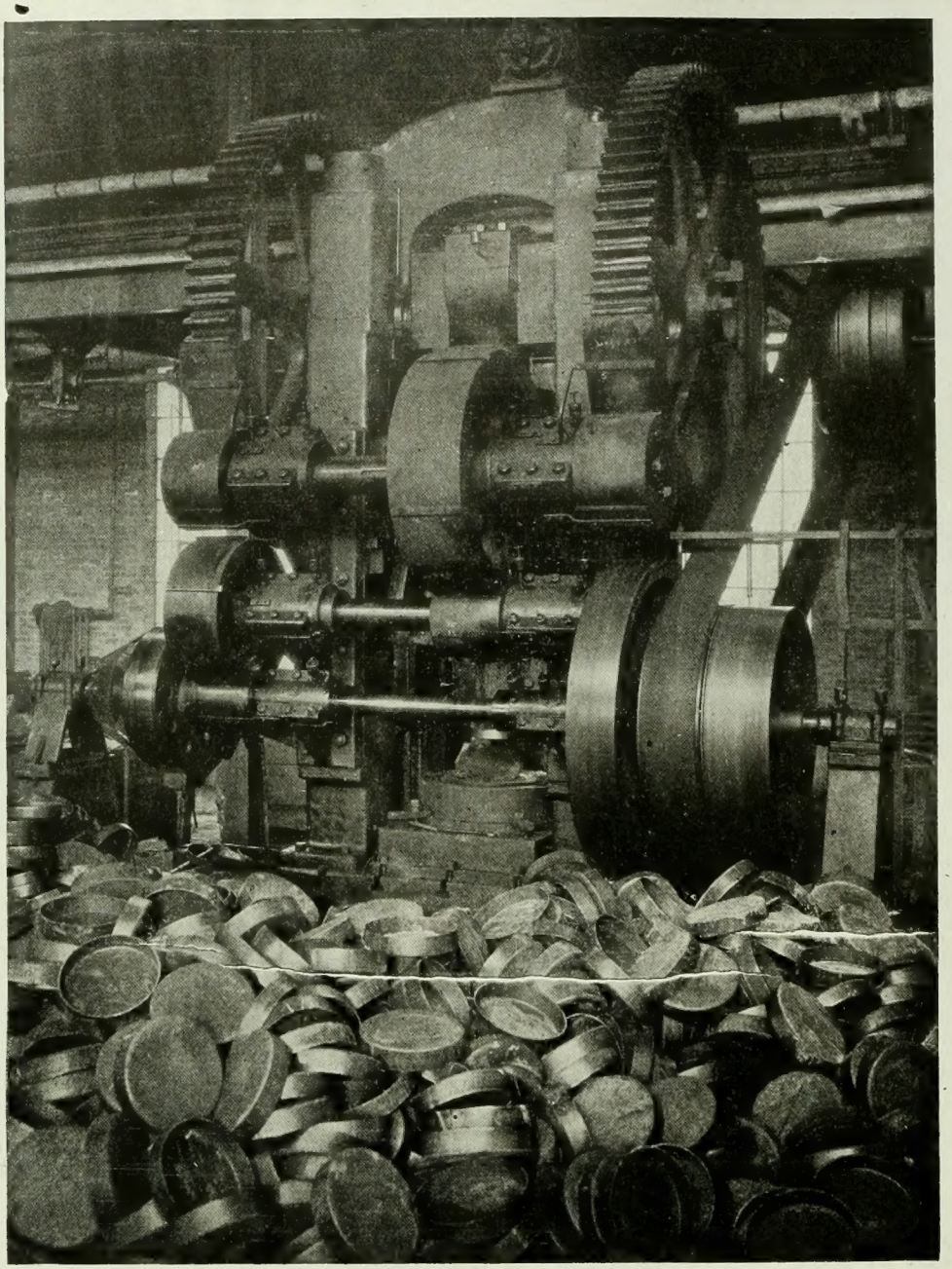
VANCOUVER
609 Bank of Ottawa Bldg.

WINDSOR
Davis Building

WINNIPEG
1205 McArthur Bldg.

HALIFAX
Roy Building

If interested tear out this page and place with letters to be answered.



This "BLISS" No. 80½ Straight Side Press is in the service of Ireland & Matthews Mfg. Co., Detroit. We have no statistics about it and the pile of brake drums that surrounds it so we don't know how many hours' or days' output this represents.

Whatever the rate of production, it is evident that they can't take it away fast enough to keep up with this press.

BLISS 1857

E. W. Bliss Company

Main Offices: BROOKLYN, N. Y., U. S. A.

American Factories: BROOKLYN, N. Y.; HASTINGS, MICH.; CLEVELAND, O.; SALEM, O.

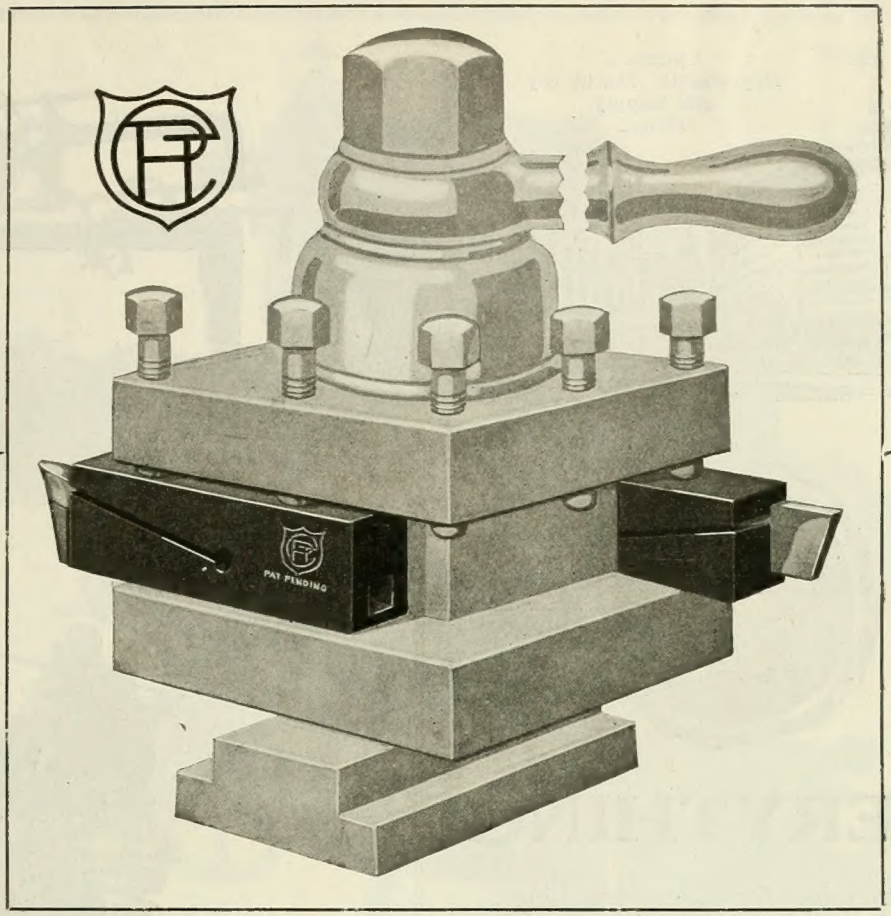
BLISS 1921

SALES OFFICES

CHICAGO, People's Gas Bldg. DETROIT, Dime Bank Bldg. CLEVELAND, Union Bank Bldg.
CINCINNATI, Union Trust Bldg. BUFFALO, Marine Bank Bldg. ST. LOUIS, Boatmen's Bank Bldg. PITTSBURGH, Keenan Bldg.

FOREIGN SALES OFFICES *and* FACTORIES

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S. E. PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen



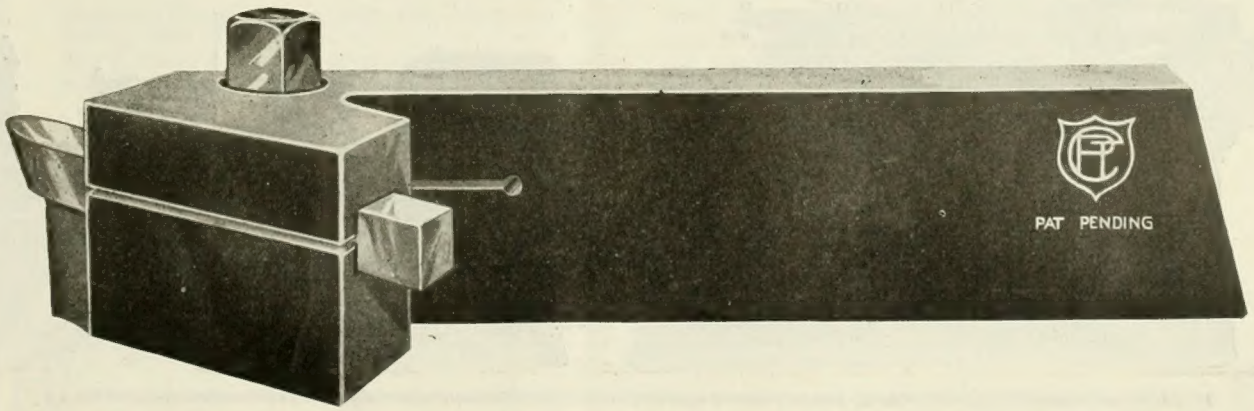
Announcing

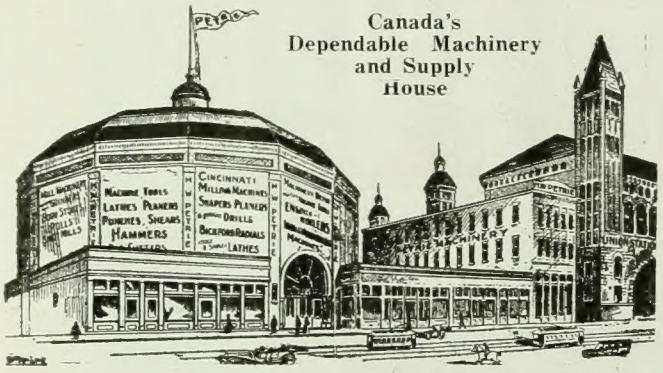
CANADIAN PRODUCTION TOOL COMPANY LIMITED
WALKERVILLE, ONTARIO, CANADA

Manufacturers of High Grade

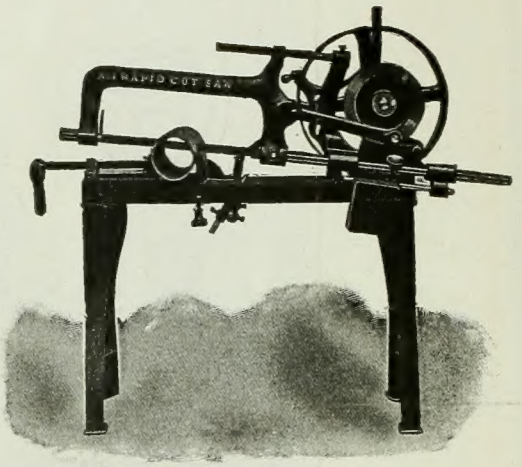
Tool Holders

Send for Catalogue





Canada's Dependable Machinery and Supply House



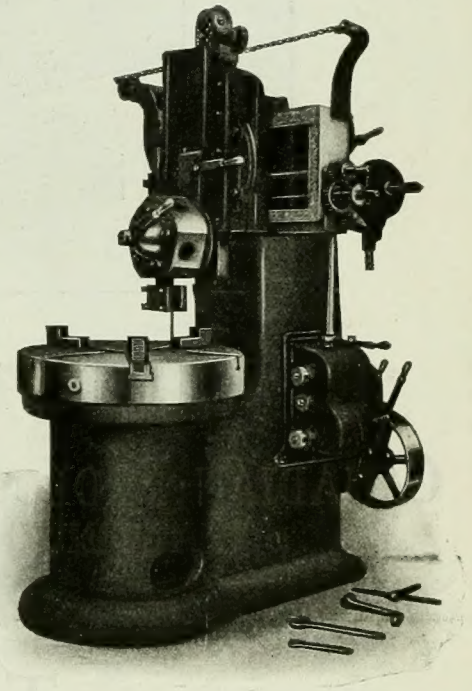
EVERYTHING

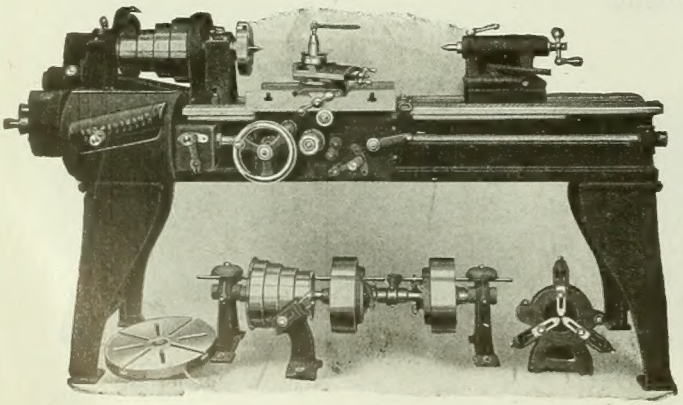
you require for your machine shop in the line of machine tools and supplies is carried in our mammoth warehouses—the largest of their kind in Canada. Many used machines at very moderate prices are among our immense stocks. Just the machine you want may be included in our lists —let us know your requirements.

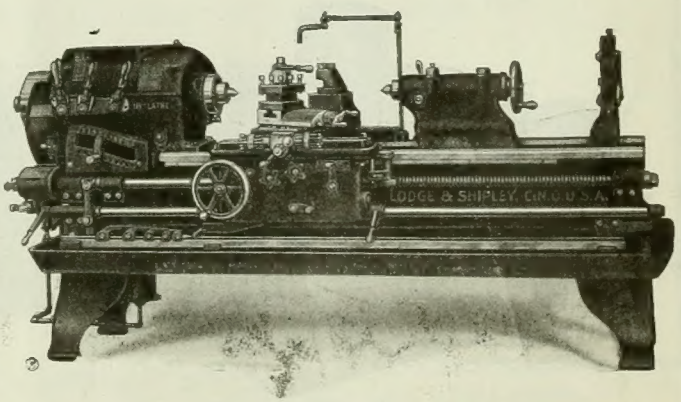
QUALITY---SERVICE

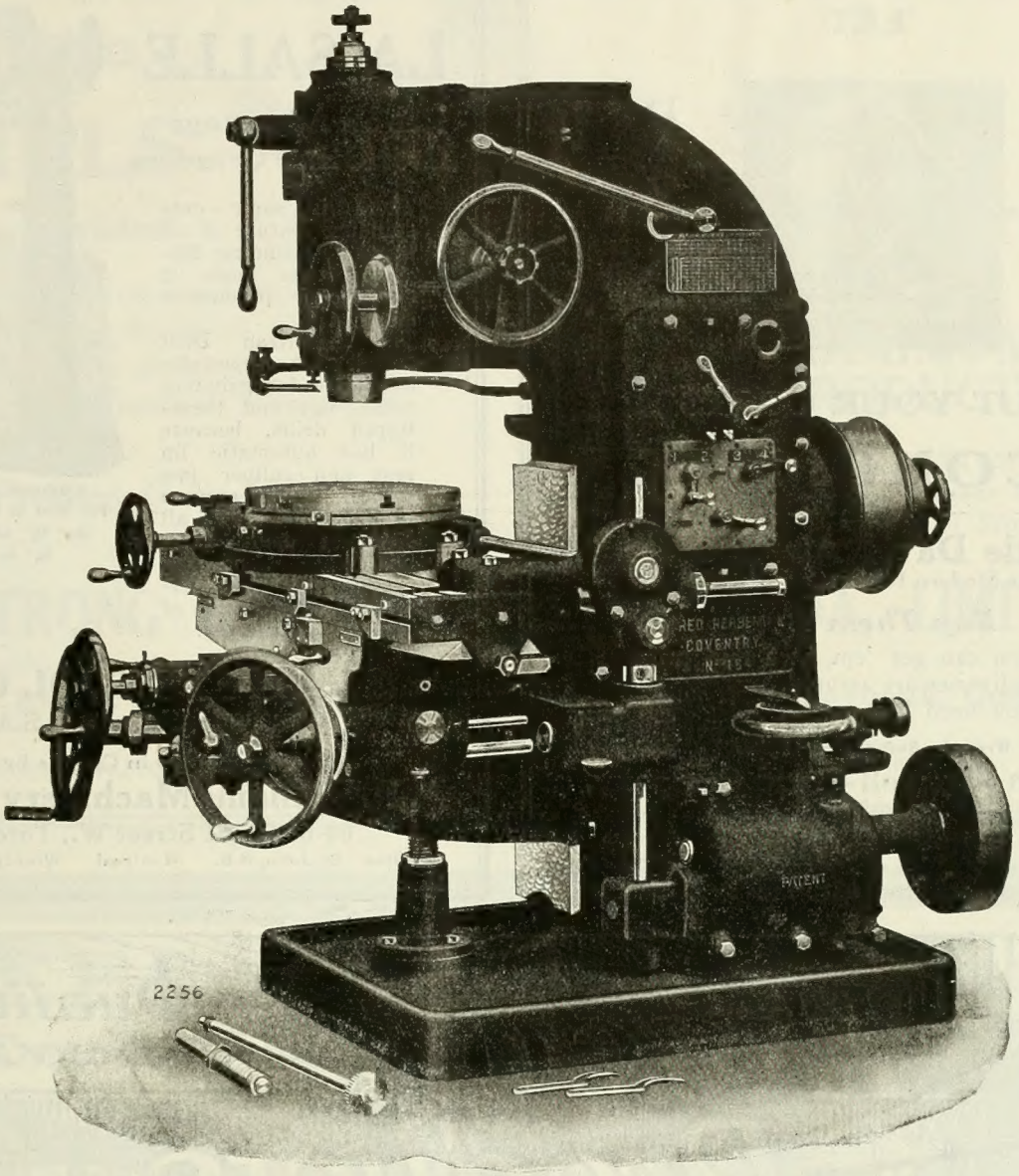
H. W. PETRIE LIMITED

TORONTO and HAMILTON









Capacity 34" x 13½" x 20"

No. 16 Single Pulley

VERTICAL MILLING MACHINES

DELIVERY FROM STOCK

LEADING FEATURES:

Improved Spindle Nose with Box-clutch drive.
Patent Dial Feed Motion.
Speed variator and Feed levers interlocked for safety.
Automatic Longitudinal Transverse and Vertical Feeds.
Longitudinal Feed Nut adjustable for wear.
Quick Power Motions in all directions.
All sides clamped from front of knee.
Great Power and Massive Construction.
Automatic Lubrication of Driving Box, Feed Box, Feed Gears and Table Slides.
Unrivalled convenience in operation.
Knee boxed in completely.
Long bearing of knee on column.
Telescopic Elevating Screw to knee.

ALFRED HERBERT, LTD.

Phone No. 4409 Adelaide

1-3 JARVIS STREET, TORONTO

Head Office and Works: Coventry, England

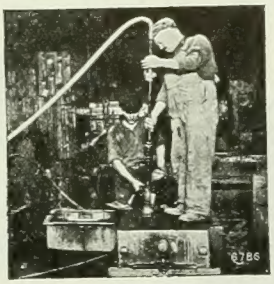
New York Office 54 Dey St.

Turret Lathes, Engine Lathes, Horizontal Boring Machines, Boring Mills, Planing Machines, Slotting Machines, Shaping Machines, Profiling Machines, Grinding Machines, Sawing Machines, Precision Machines, Chucks, Die Heads, Tool Room Equipment, Foundry Equipment, Drills, Milling Cutters and Small Tools.

If interested tear out this page and place with letters to be answered.

LET

LITTLE DAVIDS



CUT YOUR COSTS

ECONOMIZE

with

"Little David Air Tools"

The Modern Production Hustlers

Buy Them Now

When you can get 'em at a fair price.
When deliveries are assured.
When you need 'em most.

Write for Bulletins and Prices

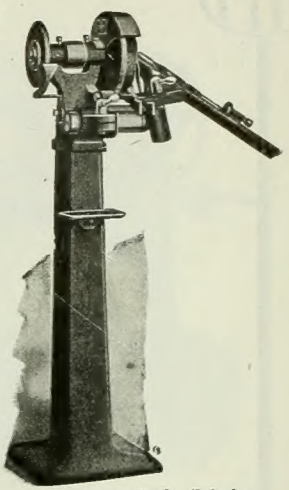
Canadian Ingersoll-Rand Company, Limited

Sydney Sherbrooke Montreal Toronto
Cobalt Winnipeg Nelson Vancouver

LA SALLE

Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.



American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

LA SALLE TOOL CO.

La Salle, Illinois, U.S.A.

Represented in Canada by

A. R. Williams Machinery Co., Ltd.

64-66 Front Street W., Toronto

Halifax St. John, N.B. Montreal Winnipeg Vancouve

Hisco Products

Quality & Service

"Hisco" Machine—Molded Gears

The fact that "Hisco" Machine Molded Gears require no pattern is a factor of considerable importance when the price of lumber and labor is so high. "Hisco" quality insures accurate, dependable gears. Remember — **the price of "Hisco" gears does not include the cost of patterns.**

We are also manufacturers of Steel, Chrome, Manganese and Nickel Steel Castings, Annealed and Unannealed; Cement Mill and Mining Machinery; Castings; Stamp Mills; Crushing Plants; Excavating Outfits; Steel Car Wheels; Locomotive Driving Wheels and Frames, etc.

Let us know your requirements—we do the rest.

Hull Iron & Steel Foundries, Limited

HULL, Quebec

TRADE MARK

"AW" DRILLS

Milled or Twisted

From the raw materials entering the steel to the finished drill a rigid inspection is given after each operation, which assures a superior product.

Prompt Deliveries on Special Sizes

High Speed Twist Drills

The Drills for MAXIMUM PRODUCTION

All Standard Sizes Carried In Stock.

ARMSTRONG WHITWORTH OF CANADA, LIMITED

Head Office: 298 St. James St., Montreal

Works: Longueuil, Que.

BRANCHES:

126 WELLINGTON ST. W., TORONTO

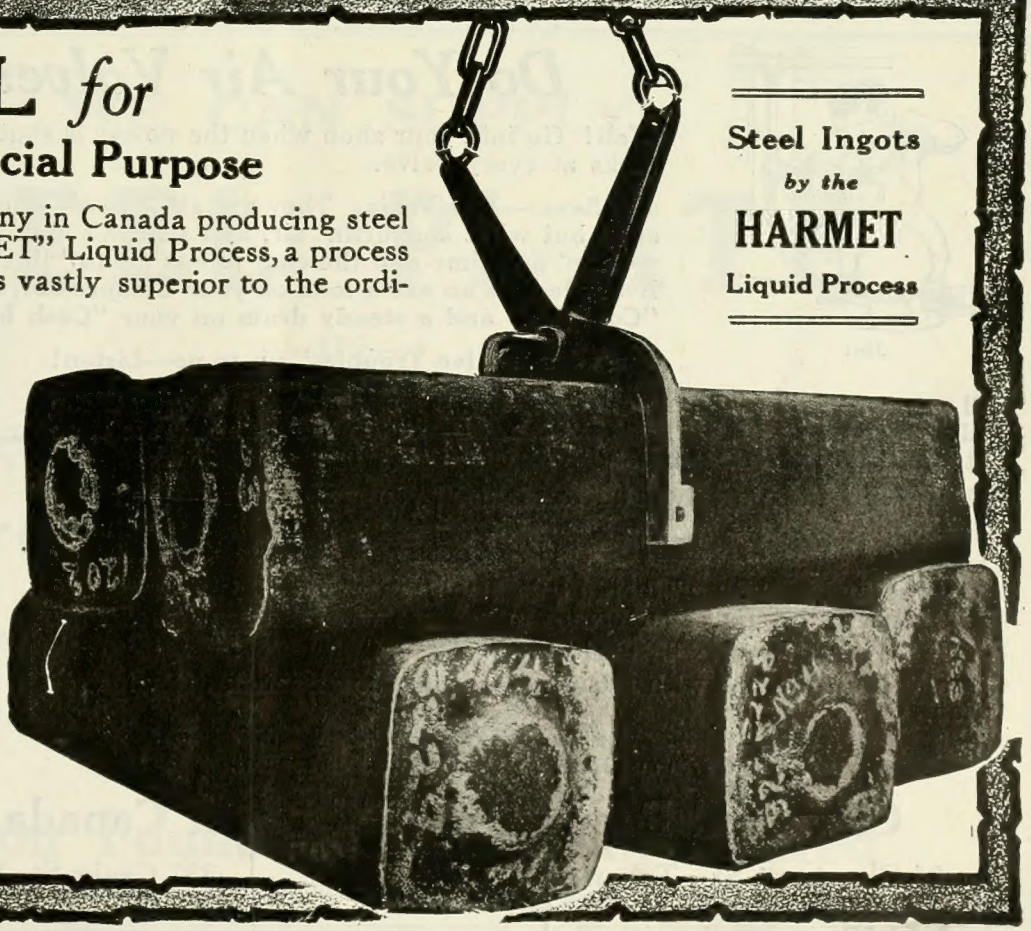
McARTHUR BUILDING, WINNIPEG

STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.



Steel Ingots *by the* HARMET Liquid Process

Nova Scotia Steel and Coal Co., Limited

Head Offices:

New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL

THE JOHNSON FRICTION CLUTCH

The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency.

In that it—

1. **Involves needless equipment.**
2. **Costs too much to set up.**
3. **Prevents economical and systematic use of space.**
4. **Operates sluggishly.**
5. **Multiplies belt troubles and the resultant cost of upkeep.**

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

Adopt the Johnston Lineshaft Drive

The economical, efficient and durable method of power transmission through friction control.

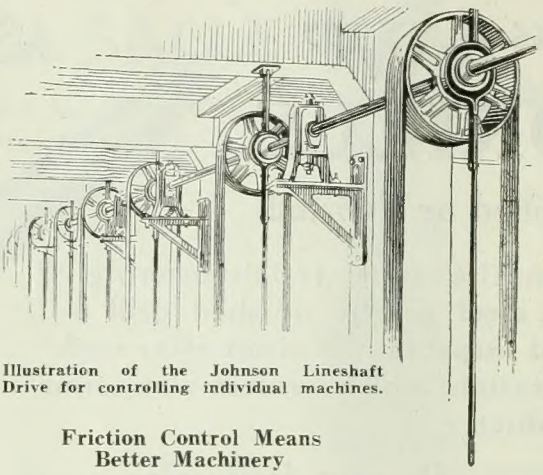
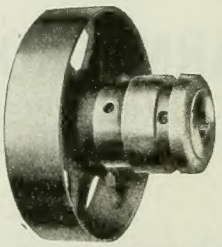


Illustration of the Johnson Lineshaft Drive for controlling individual machines.

Friction Control Means Better Machinery

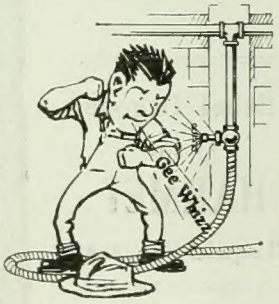
Whether it is applied overhead or in the machine itself.

Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.



CANADIAN AGENTS:
WILLIAMS & WILSON, LTD., 84 Inspector Street, Montreal
CANADIAN FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.



Jim

Do Your Air Valves Leak?

Well! Go into your shop when the power is shut off and you will hear leaks at every valve.

Jim Says:—Gee Whiz: They are all leakin'—there ain't a Valve in the shop but what is spurtin' air, and ye can't stop 'em—the compressor's workin' overtime and the coal pile is meltin' like a snow ball in June. **Every leak is an extra load on your Compressor, an added pull on your "Coal pile" and a steady drain on your "Cash box."**

Put your "Valve Troubles" up to us—Listen!

Bill says:—"Leaks," there ain't none; we stopped 'em all with **Cleco Valves**—they are all over the shop now—we don't have to waste time patchin' leaky valves, you bet."

Ask us for a sample valve and test it until you are satisfied—then buy some; you can't lose.

Cleco Air-Valves are pressure-seated—the air pressure is always on the large end of "Plug," holding it firmly on seat. No packing or springs used, the air never comes in contact with the seat, therefore no seats to replace—or springs to renew.

Cleco Valves improve with use—they require no attention after installation.

Bulletin 48 illustrates and describes our complete line of Air Valves and Hose Fittings. Mailed on request.

Bill

Cleveland Pneumatic Tool Co. of Canada, Limited

84 Chestnut St., Toronto **337 Craig St. West, Montreal**

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

CANADIAN STEEL FOUNDRIES LIMITED

AMONG OUR PRODUCTS

O. H. STEEL
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
- Wheel Centres

FERRO-ALLOYS

MANGANESE-STEEL
- Bucket Lips
- Crusher Jaws
- Dipper Teeth
- Mixer Teeth
- Special Trackwork

OTHER ALLOYS
- Crank Pins
- Crank Shafts
- Locomotive Frames
- Rolls
- Roll Shells

TRACKWORK
- Diamond Crossings
- Crosses
- Frogs
- Mates
- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersection

This list is merely an indication

General Offices:
Transportation Building, Montreal

WE CAN SUPPLY

STEEL PLATE

—IN—

Universal Edge - up to 40 in. wide

Sheared Edge - up to 60 in. wide

Any Thickness **Any Lengths**

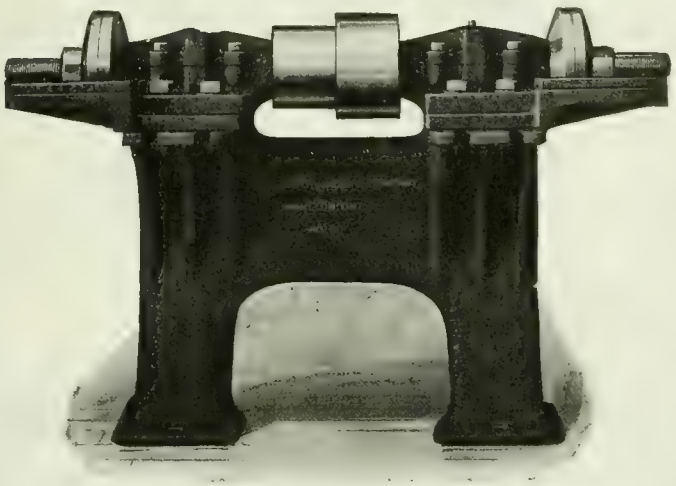
Send Us Your Enquiries.

Dominion Foundries & Steel, Limited
HAMILTON, ONTARIO

If interested tear out this page and place with letters to be answered.

Grinders

Floor, Bench, Swing, Water Tool, and Special Grinders---Polishers and Buffers



AMONG the many designs of Ford-Smith Grinders, Polishers and Buffers there is a machine exactly suited to do your work—if not we can build one.

By securing the right machine you get maximum results. Our engineers are ready to co-operate with you at all times in making a selection.

FORD-SMITH

MACHINE CO., LTD.

HAMILTON, ONTARIO

Foreign Agent: W. E. Storey, London, Eng.

Heat Under Accurate Control

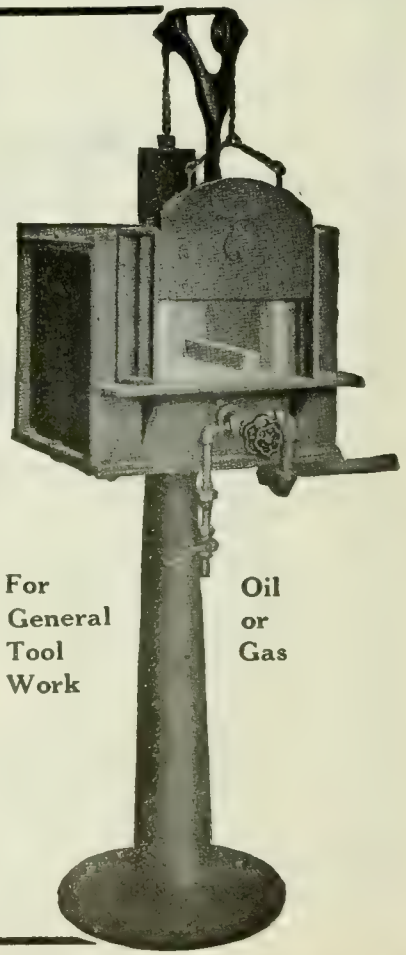
Here is an important factor in the heat treatment of metals. An intense heat, rapidly developed, and always under accurate control of the operator, is a feature that distinguishes

BELLEVUE FURNACES

These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

Combustion is perfect and no flames come in contact with material. Built to stand the highest temperature. Doors are properly counterbalanced. In every way BELLEVUE FURNACES meet with the demand for durability, efficiency and convenience.

Let us advise you about your heat-treating problems



For General Tool Work

Oil or Gas

Bellevue Industrial Furnace Company

Julius C. Hinz, President

703 Bellevue Ave. - Detroit, Mich.

Representative in Canada: H. W. PETRIE, LIMITED, Toronto, Canada

BROWN-BOGGS

B B

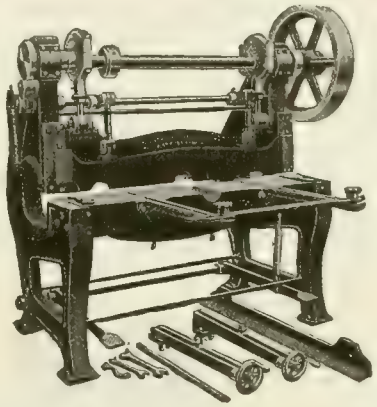
Stands up under the excessive stress of actual service

It is not sufficient that a machine be speedy and accurate on a short trial run—it must be fast, accurate, and able to withstand the excessive stress of actual service. The losses of break-downs cannot be made up by "spurts" of efficiency.

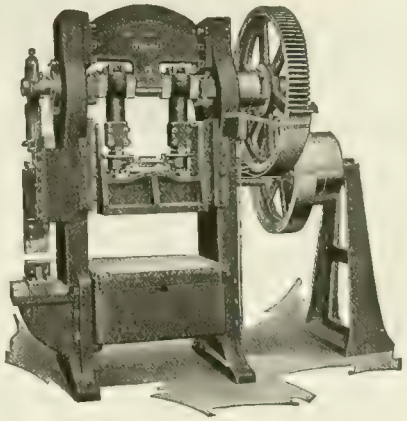
"B-B" Tools, by their dependable, year-in and year-out service, have gained an enviable reputation for "standing the gaff."

The "B-B" line comprises tinsmiths' tools and sheet metal working machines of every description; canners' and evaporators' machinery, shears of all kinds, power presses for punching, forming, embossing, blanking, etc.

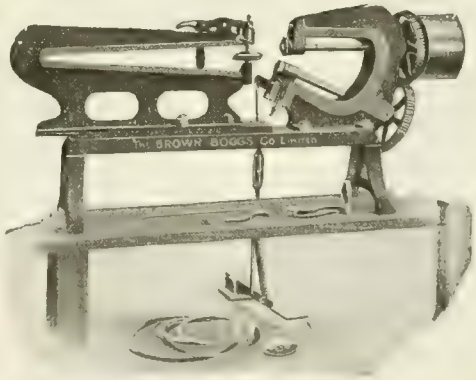
Specify "Brown-Boggs" and you are assured of long, efficient service.



No. 449—Shear



No. 140—Double Crank Trimming Press



No. 36—Ring and Circular Shear

THE BROWN-BOGGS CO. LIMITED

HAMILTON, CANADA.

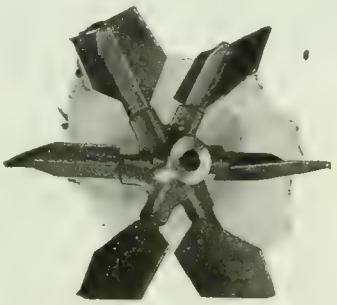
Canadian

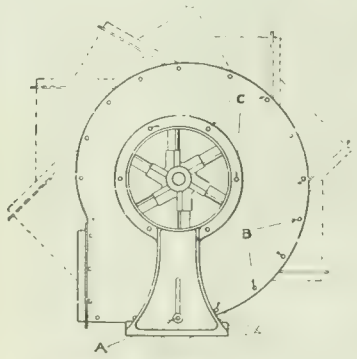
The Canadian Standard Reversible Mill Exhauster will keep your shop clean, remove sawdust, shavings, fumes, gas or any loose materials and disagreeable odors.

Insurance rates can be reduced; floors and machines covered with sawdust, chips or shavings, increase the fire risk.

Insurance companies reduce the premiums where adequate precautions have been taken to prevent fires.

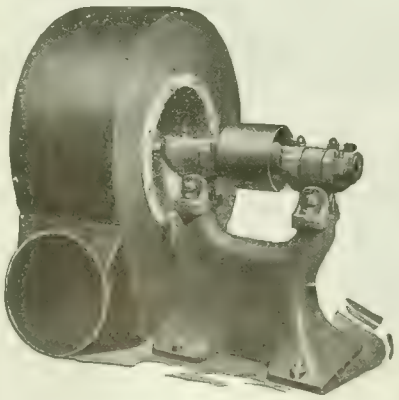
Blast Wheel — This wheel is so constructed that it will handle any kind of stringy material efficiently, such as sawdust, shavings, cotton lint. Will also handle gases, fumes, smoke, etc.





The Canadian Standard Planing Mill Exhausters have reversible housings so that the outlet can be adjusted instantly to any angle desired.

This eliminates necessity of crossed belts. Simplifies changes on alterations in piping or building.



The housing is of heavy rolled steel plate securely bolted together with angle irons. Round cast iron outlet bolted to the housing. Blast wheel mounted on heavy cast iron spider.

Every fan carefully tested by running test at speeds in excess of that required.

Write for Catalog 16.

Canadian Blower & Forge Co.

Kitchener - Ontario

GREY IRON CASTINGS

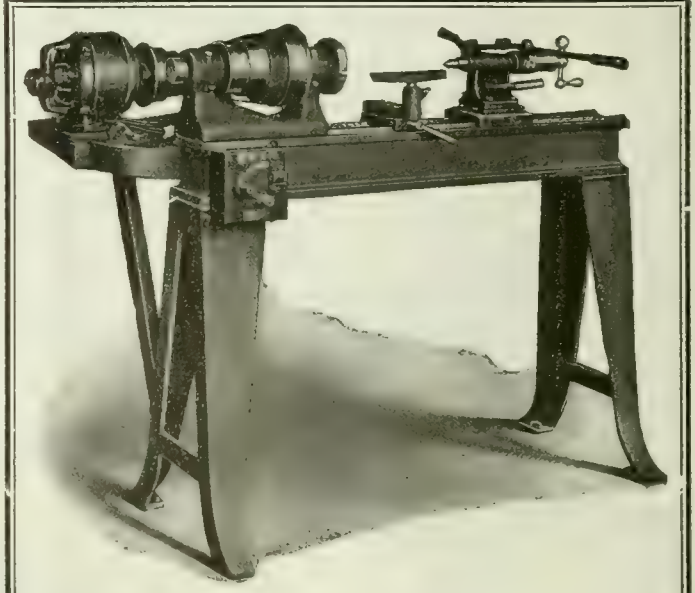
Also

Brass, Bronze, Aluminum, Copper, Zinc and Nickel Castings

QUALITY!
SERVICE!

Canadian Hanson and Van Winkle Co., Limited

Toronto - - - Canada



Built For *Service*

This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

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Here's a Fair and Square Die Offer. Use It!

We are going to send you a Murchey Tap and Die on 30 days' approval. We are going to **prove** to you right in your own shop that

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TAPS AND DIES

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Please send me, for 30 days' approval, a Murchey Tap and Die to thread part as shown on enclosed blue print. This in no way obligates me.

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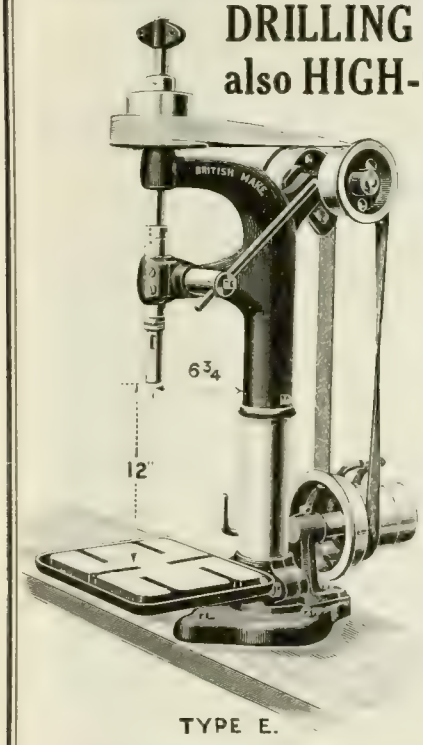

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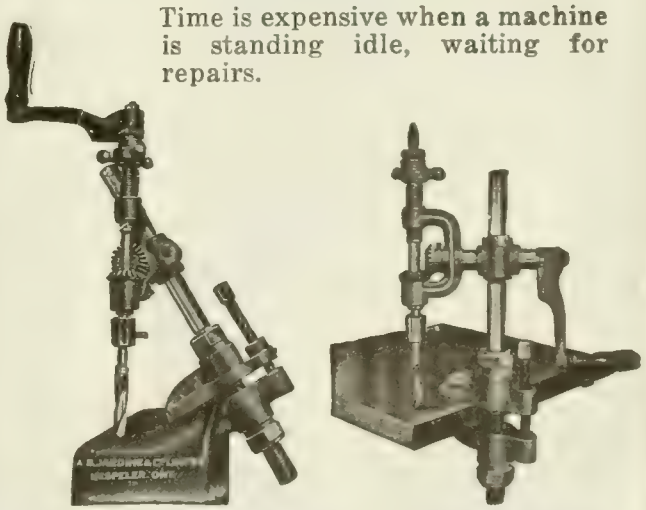
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
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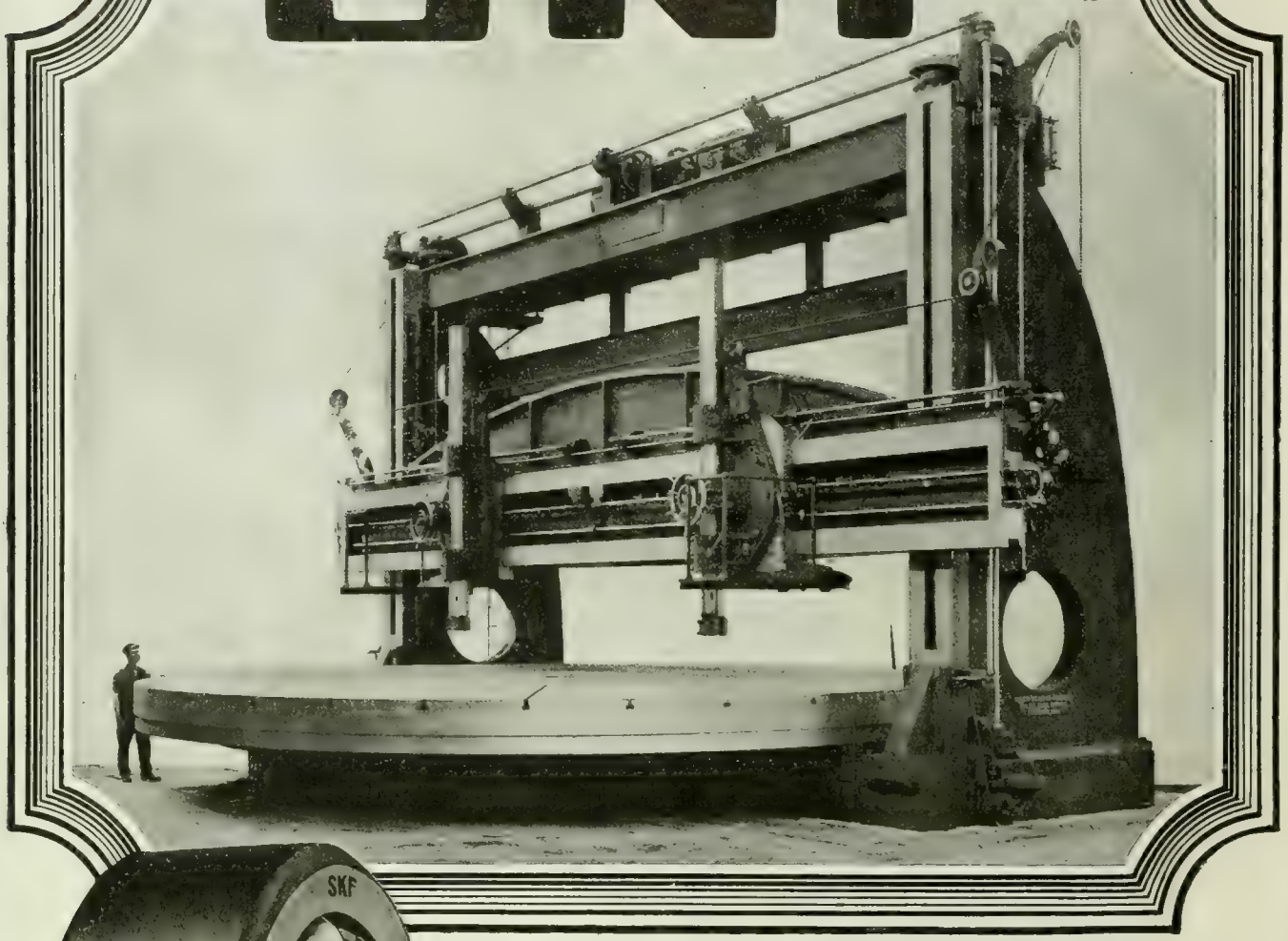

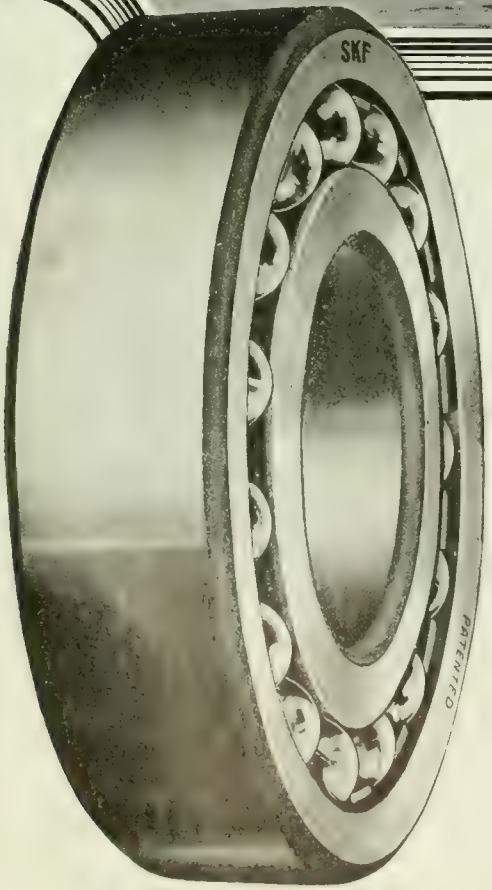

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THIS Columbian Quick-Acting Vise, with a jaw opening of 6 inches, can be opened the full length of the screw in ½ of a second. It takes 30 *times as long* to rotate the handle and open an ordinary vise of the same size.

This new vise is an addition to the many other types of machinists' vises already included in the Columbian line. It is extremely simple, there are no complicated parts to get out of adjustment. A slight pressure of the trigger with the forefinger releases the screw and allows the beam to slide freely in either direction. Made in stationary and swivel base types; 7 sizes from 3 to 7-inch jaws, opening from 4½ to 12 inches. The jaw faces are removable and may be replaced with specially shaped jaw faces.

The new Quick-Acting Vise, however, is a highly specialized vise designed for machine shops in which a great many similar pieces pass continuously through the same operation. On such work as this, in an accurately timed test, an operation requiring two settings in the vise was done in an ordinary vise in 24 seconds. With a Columbian Quick-Acting Vise the same operation was done in 15 seconds.

This is a saving of 37½%!

Like all Columbian machinists' vises this Quick-Acting Vise is made of malleable iron and is twice as strong as any cast iron vise of the same rating. The famous Columbian Sledge-Test proves this conclusively.

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World's Largest Makers of Vises and Anvils

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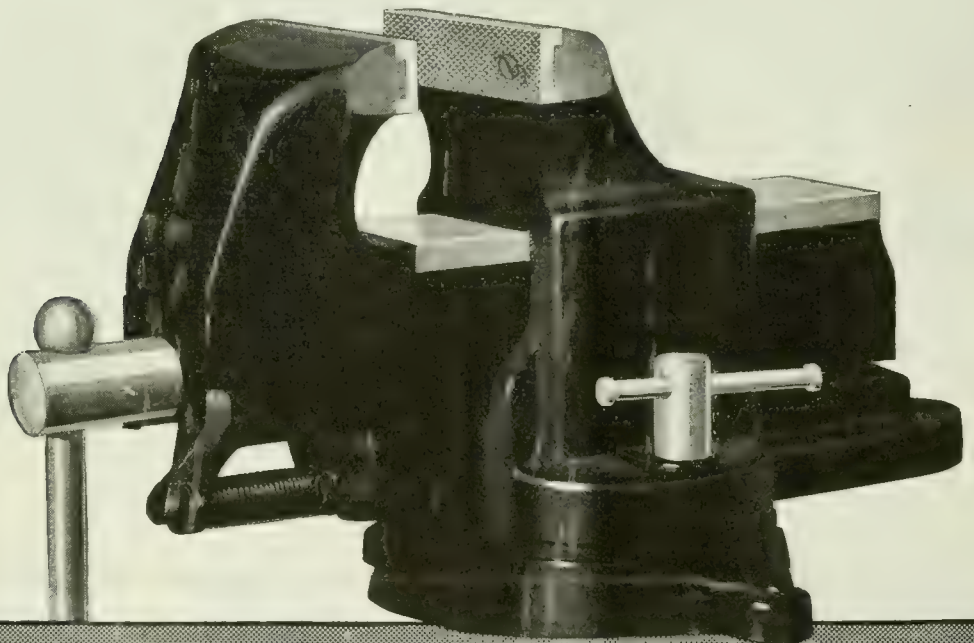

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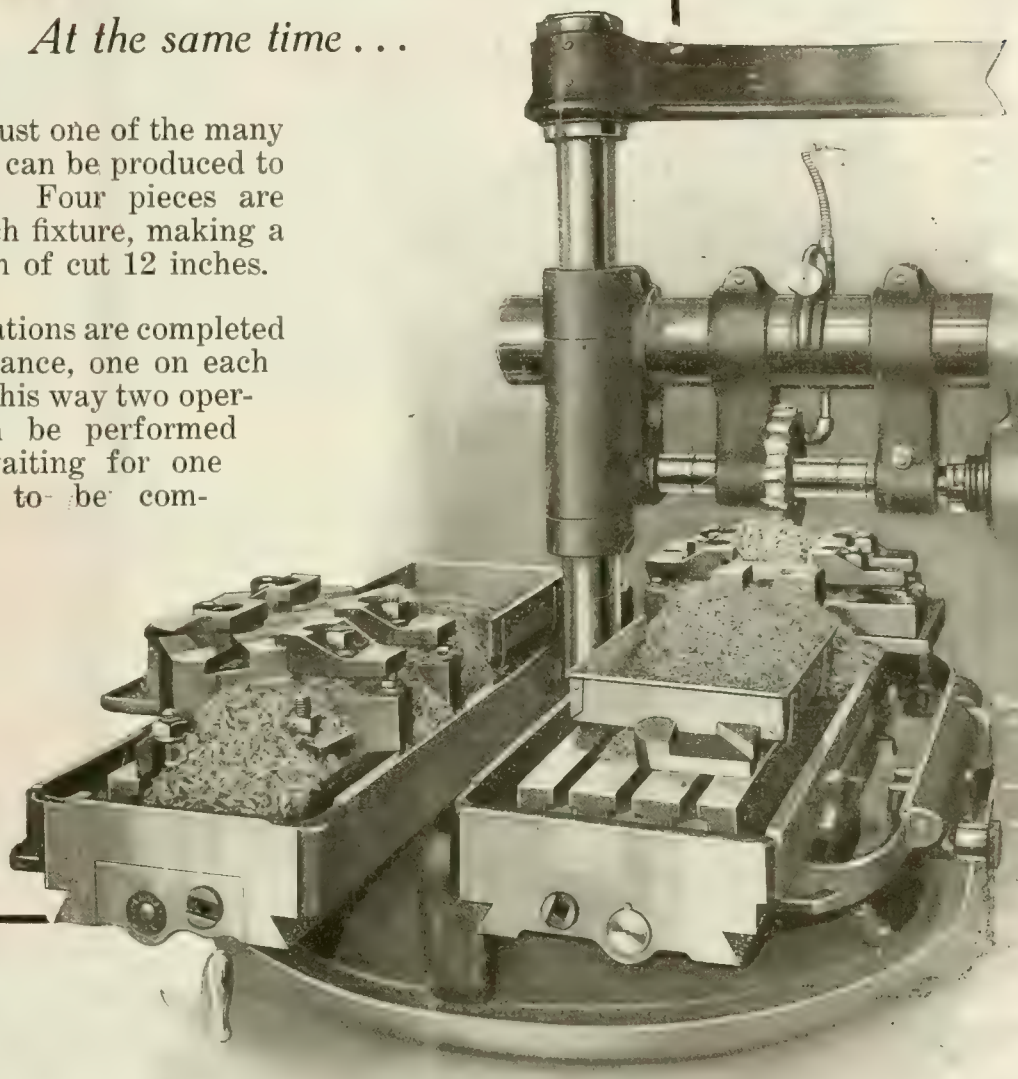
At the same time . . .

Here is just one of the many pieces that can be produced to advantage. Four pieces are held in each fixture, making a total length of cut 12 inches.

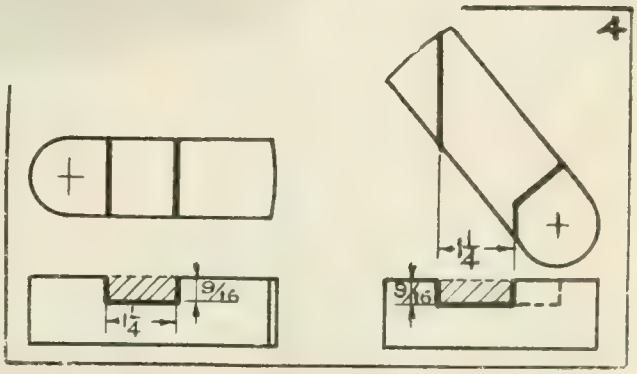
Two operations are completed in this instance, one on each table. In this way two operations can be performed without waiting for one operation to be completed.



Compare this with your work and investigate this manufacturing proposition.

No lost motion.

No marks from returning cutters.



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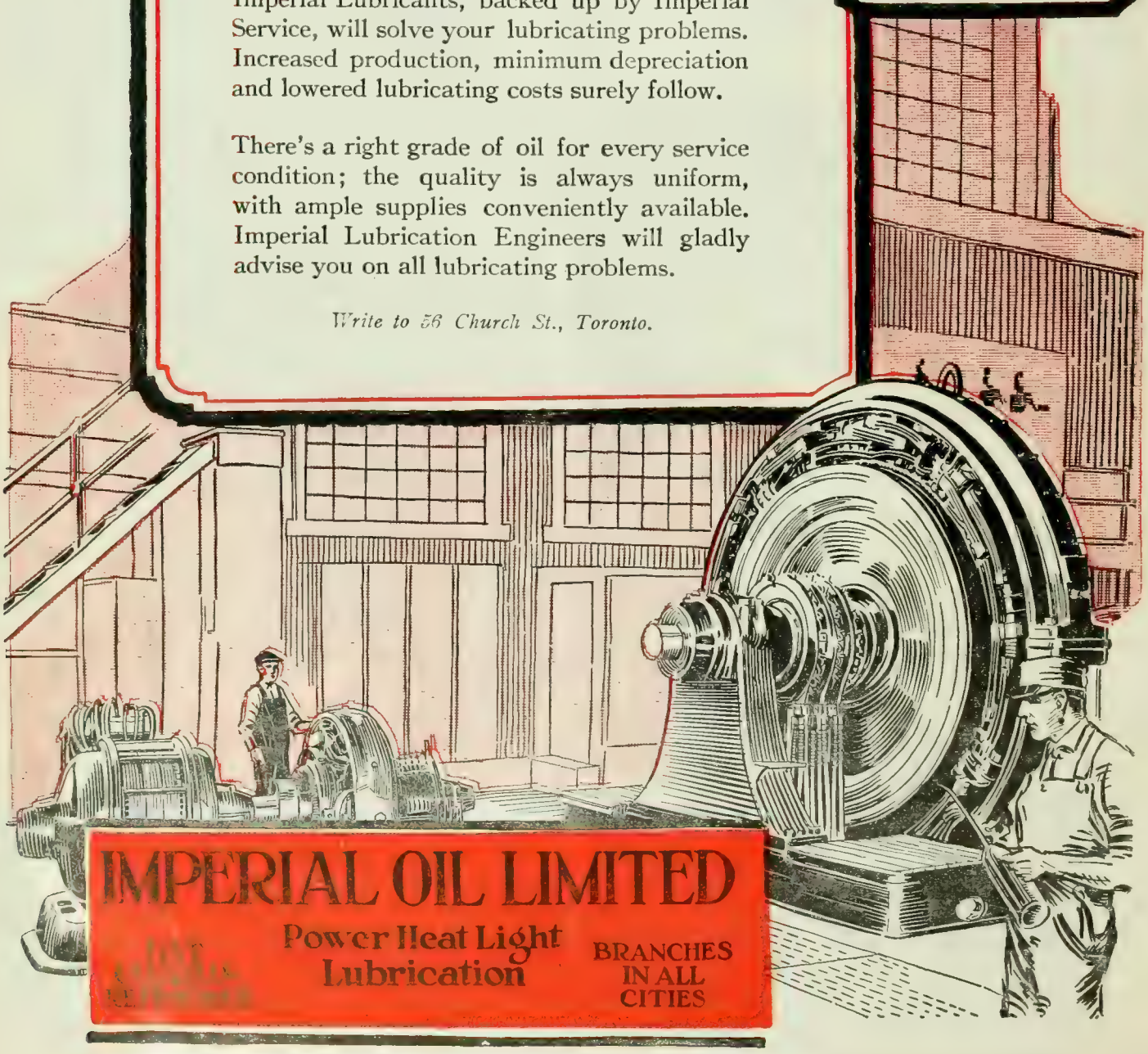

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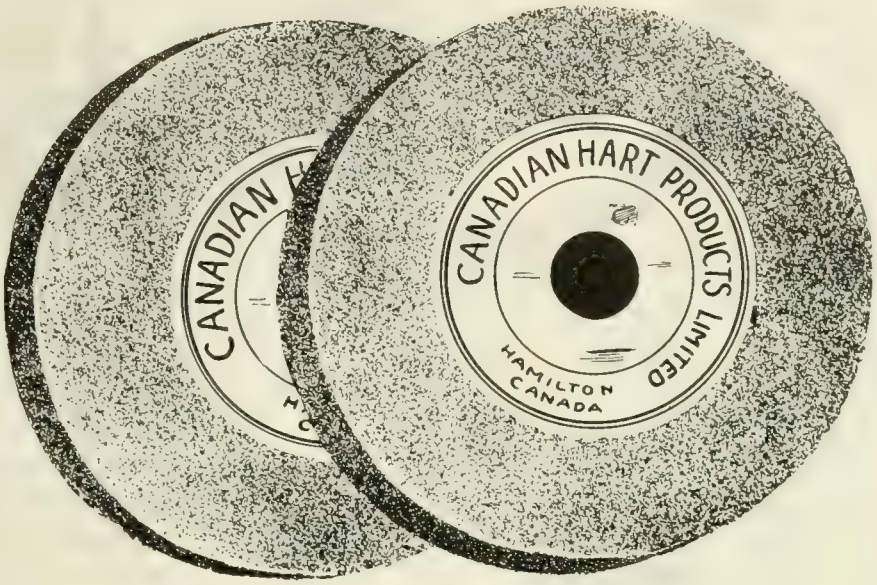

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Just a line or two from you acquainting us with the nature of the work you wish to grind and we will select the "Canadian Hart" best suited for the purpose. There is satisfaction and profit in having us choose the right grinding wheels.

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Write for
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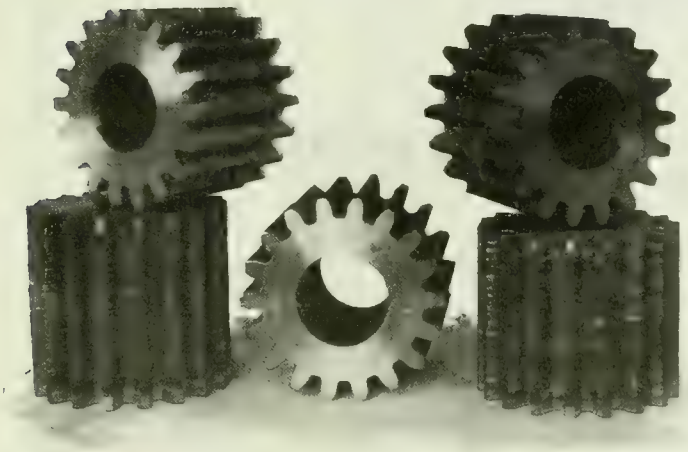

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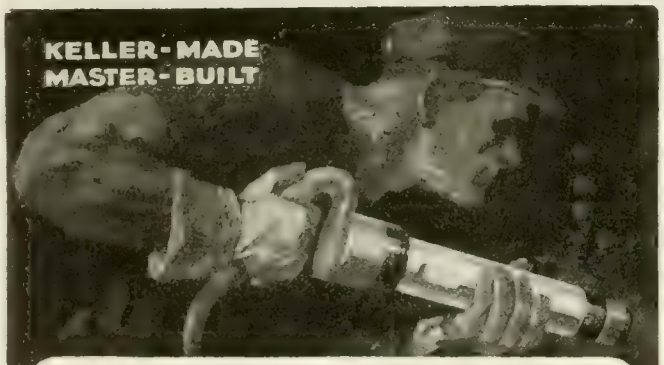

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DIAMOND FIBRE
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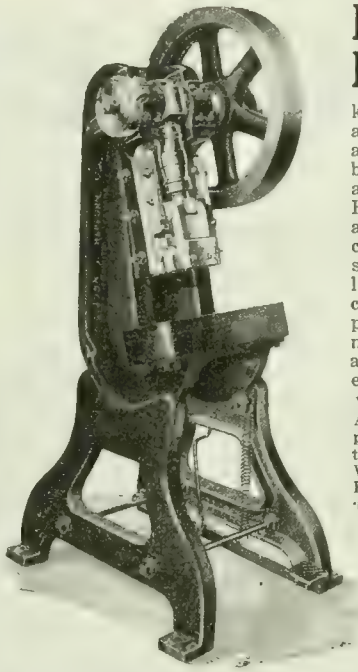

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keep on turning out accurate work long after an ordinary press has to be scrapped. Why? The answer is simple. Every Hepburn Press is strong and well built. The cranks are made from solid forgings and give long strokes. The entire construction is so proportioned that weaknesses never occur. Quick adjustability a feature of every press.

Write for specifications. Also, we will gladly give particulars about our Vertical Engines, Compressors, Winches, Derricks, Steam Pumps, Blacksmith Work and Acetylene Welding

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The Rockford "ECONOMY"

Small in Size Big in Production

An extremely accurate, Back Geared, Quick Change Engine Lathe, small in size but very powerful. Made in 12", 14", 18" and 22" swing.

Write to-day for full particulars.

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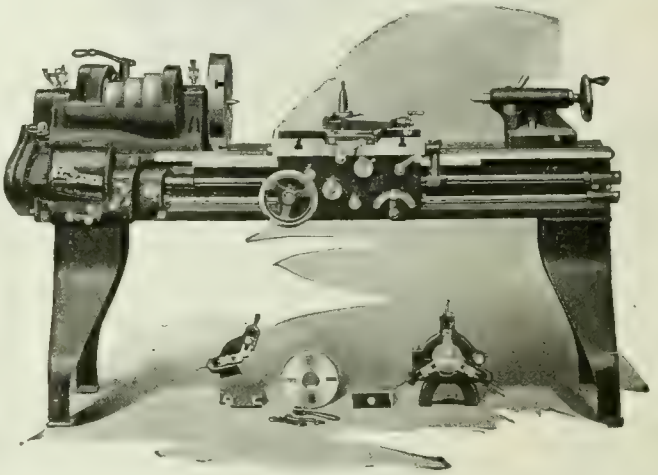

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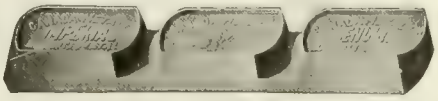

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For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.

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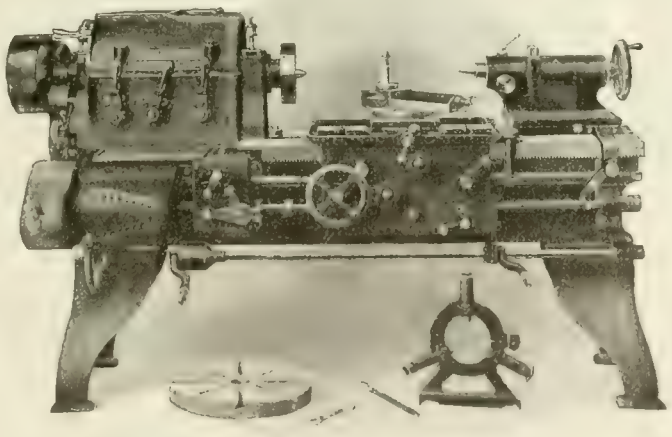
The "Lehmann" Improved Selective Head Lathes
(Patents Pending)

SIZES—14" to 24" SWING

On account of its simplicity of construction, great driving power and rigidity, ample range of speeds, moderate tooth travel of its gears, compact and shapely appearance, the "LEHMANN" Selective Head Engine Lathe stands to-day in a class *ahead* and *alone*. Some of the features of construction are:



Sixteen Spindle Speeds in correct geometrical progression obtained with the use of only **ten** gears.

Improved Friction Clutches (Patents Pending) running in oil, requiring no adjustment and giving forward and reverse control to spindle.

Heat-treated or Hardened Steel gears.

All Shafts, except spindle, running on ball bearings.

Spindle of alloy steel, hardened and ground at the bearings and running in phosphor bronze boxes.

Head Casting forms oil-tight case enclosing all running parts.

In addition these lathes embody all features such as the patent quick change mechanism, the tailstock spindle locking device, the rod and screw shift, etc., forming part of the "LEHMANN" Cone Head Lathes which have acquired an enviable reputation for accuracy and production.

Let us describe more fully this Exceptional Lathe and its Distinctive Advantages

Lehmann Machine Company - St. Louis, U.S.A.
Chouteau Avenue at Grand

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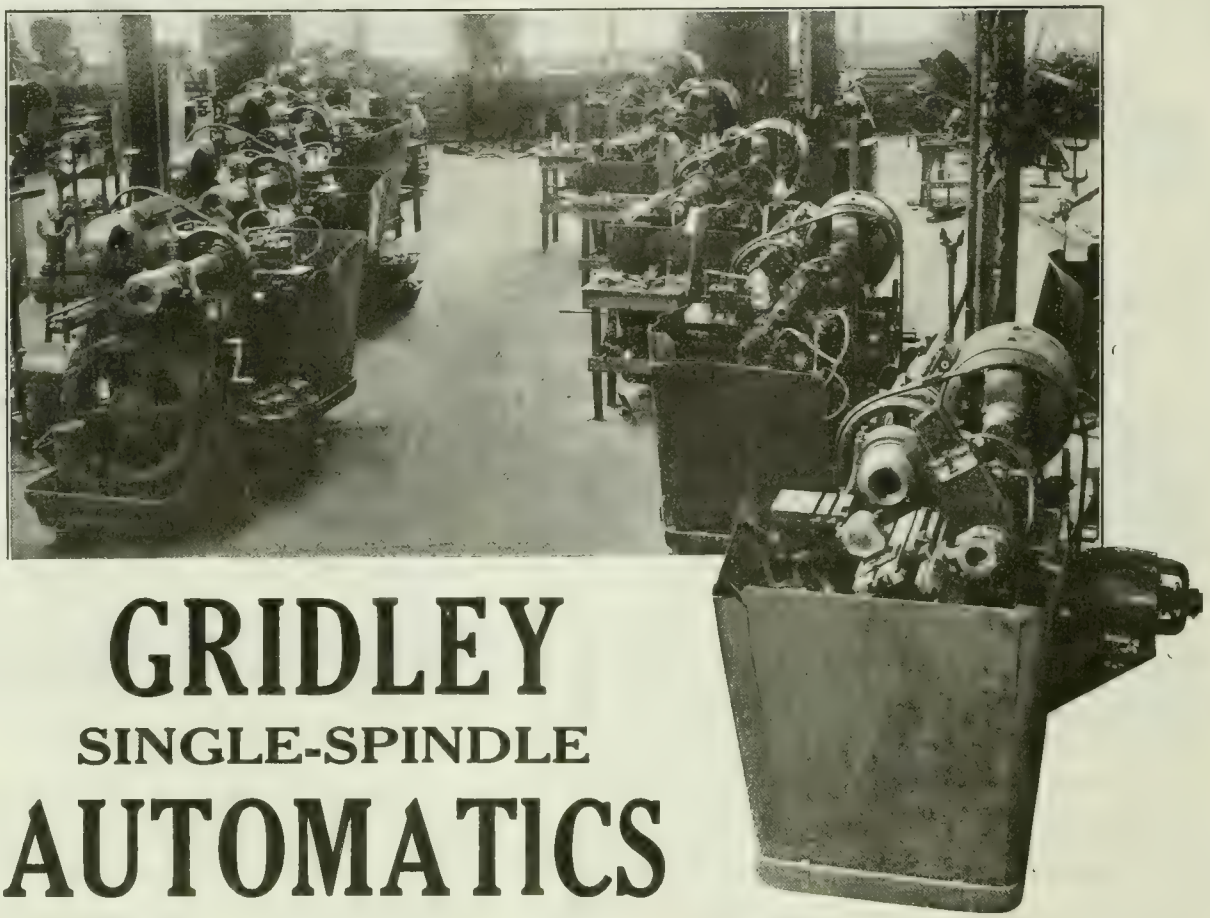

GRIDLEY
SINGLE-SPINDLE
AUTOMATICS

Where you find one Gridley, you will find the second, the third, and so on—the number representing a high percentage of the owner's total requirements for automatic turret lathe production.

Is this not evidence that each machine is constantly adding proof of Gridley ability to produce duplicate parts speedily and accurately?

Better yet, doesn't it mean that Gridley satisfaction is eventually found in the low unit cost per piece?

Regardless of the amount or kind of your work, get the figures. Let us send you the proof.

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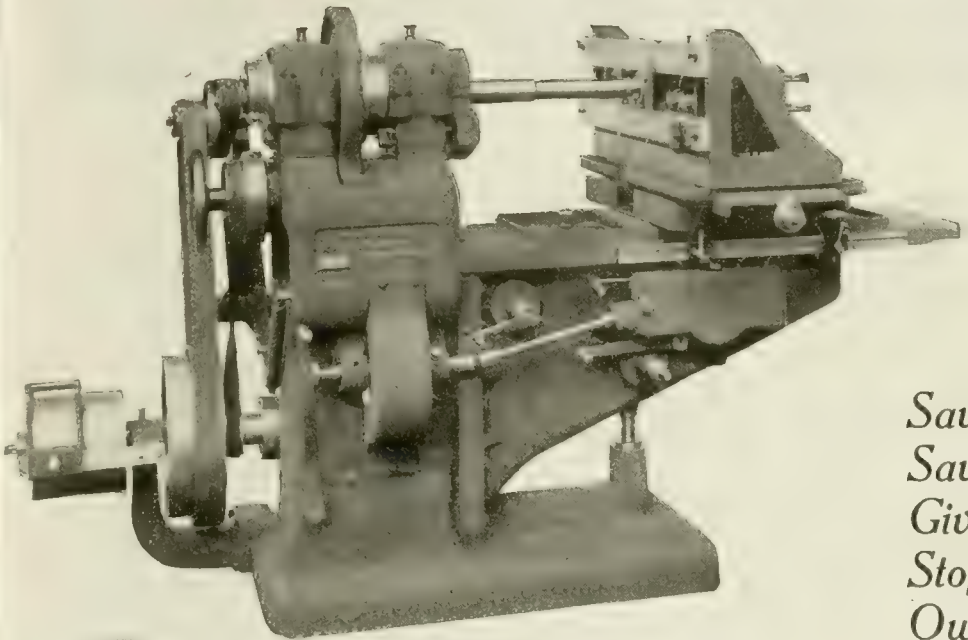


A real re-grinding machine. See how easily it handles a six-cylinder en bloc.

Regrinding Cylinders

Saves Gas
Saves Oil
Gives More Power
Stops Smoking
Owners Demand It

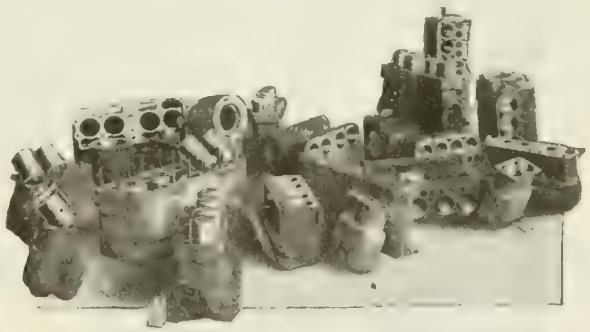
Whether you are already interested in automobile repairing or are seeking some profitable business to go into, be sure to consider the regrinding of motor cylinders.

Here is a new field of opportunity that has been barely scratched. With some thousands of registered cars that are being overhauled and whose worn and scored cylinders will require regrinding to bring back the original power, pep and economy of a new car, the possibilities are unequaled in any other business at the present time.

The Heald Style No. 55 has been just put on the market for this work. The capacity and range is such that it will handle all sizes and styles of cylinders usually found in the regrinding shop. It can be bought at a fair price, easy to set up, simple to run and maintain, with a capacity that will give you jobs you never planned on.

Some one in your vicinity is going to buy a Heald and get the cream of a profitable business.

Are you the one?



Handles all sizes and shapes of cylinders.

The Heald Machine Co.

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SAVED!

—from the Scrap Heap

THOUSANDS of new castings, forgings, stampings are saved from the scrap heap daily by the Lincoln Arc Welder, which fills in the defects, cracks or machining errors with molten steel, leaving a piece which will machine just as readily, look just as well, and stand up in service just as well as the piece which came perfect from the mould or die.

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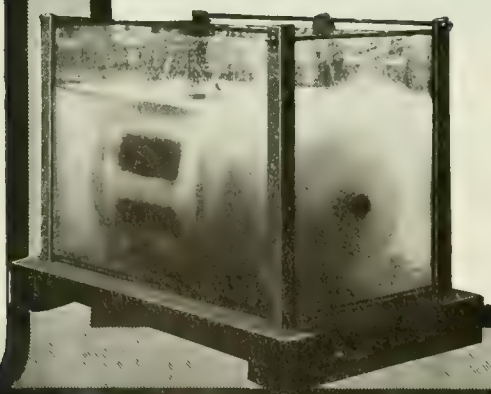
In this shop, through which more than 1,100 jobs of every description have passed, we have been able to originate and develop an electrode known as Kathode Welding Wire—something that every maintenance man, every owner of an electric welder should know about. Kathode Welding Wire is made in three grades suitable for steel welding and the welding of cast iron without preheating.

These features a Lincoln engineer will be glad to explain, frankly and fully, and entirely without obligation.

It will pay you to send for him, or if you just want our interesting welding data, simply send for it on your business letterhead to-day.

"Link up With Lincoln
For Performance and Service"



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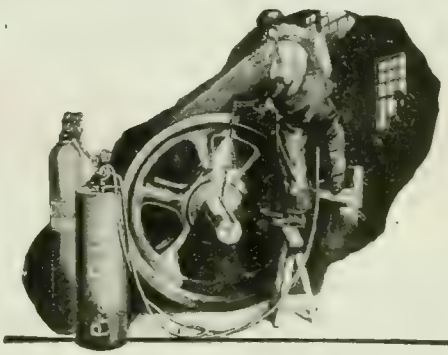

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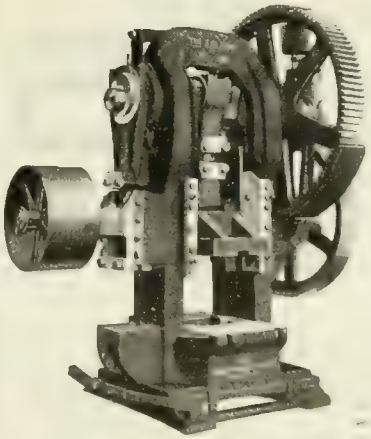

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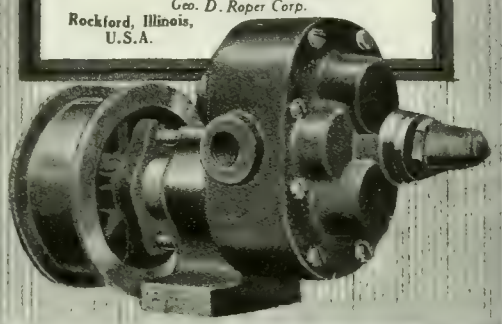

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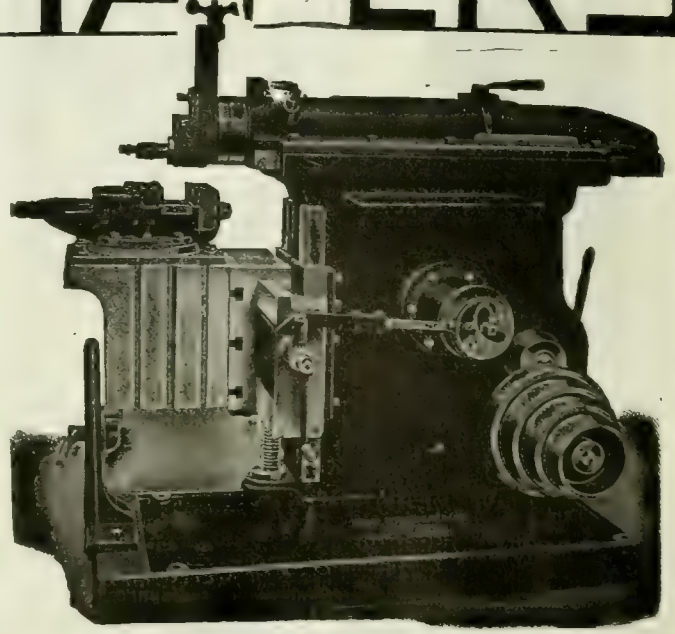

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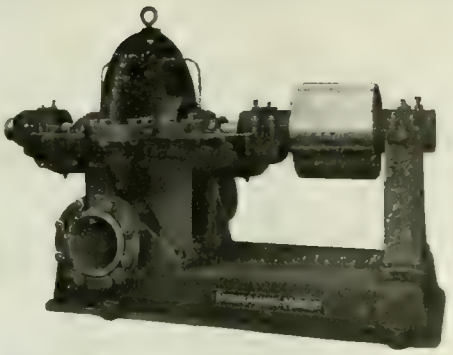

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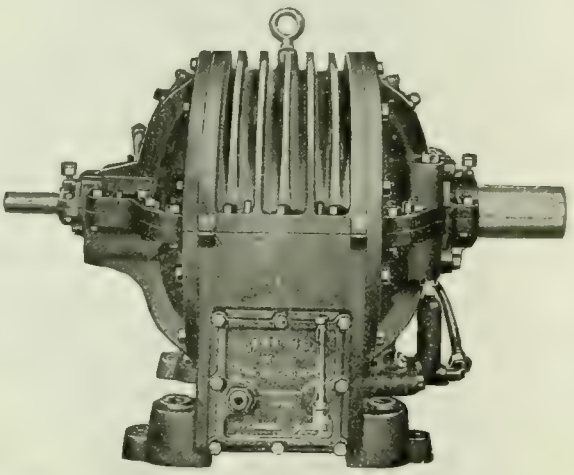

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 16. April 21, 1921

Broaching as a Production Factor

Spline broaching—keyway cutting — broaching motor frame — internal gear cutting — broaching vise jaw— broaching key slots in locks, and other interesting work.

By J. H. Moore

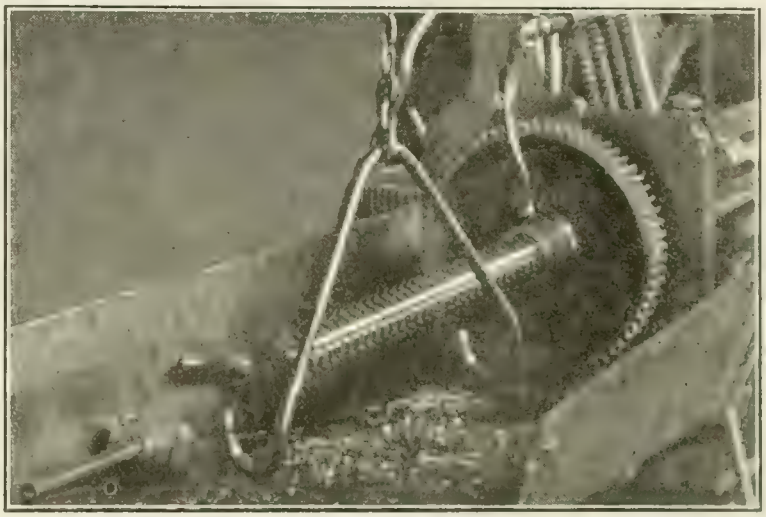


FIG. 1. AN EXAMPLE OF SPLINE BROACHING

WHAT is broaching, The average mechanic might not ask this question, but the apprentice would be almost sure to raise the point, for, if he is the right type of apprentice, he is always seeking knowledge. This does not mean that the average mechanic, or even superintendent, understands fully the scope of broaching, but in their exalted position, as the poet would put it, they leave the simple questions to the apprentice. For the benefit of those interested, here is one way in which the art of broaching might be defined.

"Broaching is the art of finishing of hôles, slots and openings, or the machining of various surfaces by tools which have a series of successive cutting teeth of increasing size. This definition holds good whether such teeth are arranged singly or in multiple."

Contrary to a somewhat general impression, broaching is not a new art. As far back as the twelfth century we have record of broaching being accomplished, but, of course, the method was extremely crude. In those days they drove a suitably shaped tool through the hole by repeated blows of a heavy hammer, and it was not until about 1901 that any decided progress in the art was made.

At that time J. H. Lapointe conceived the idea of applying this principle of cutting metal, but along modern lines. The result was the designing of power-driven machinery for pulling scientifically constructed broaches through the work. Of course, all this development work took time. Mr. Lapointe then organized a company to engage in the building of such machines, also the broaches for the same. In 1911, however, he severed his connection with the firm and organized the J. H. Lapointe Co. at New London, Conn. It is to this latter firm that we are indebted for the illustrations and information to follow.

A Talk on Broaches

At first, broaching was considered merely as a means of finishing various shaped openings quickly. But subsequent experience proved that it can also be used successfully for finishing the outside surfaces of work. Where a hole is to be broached, the work is held stationary and the broach pulled through it, but where the outside surface is to be broached, the hollow type of broach used for such purposes is held in a fixed position and the work pulled through the tool.

The broaches themselves are formed to a taper, that is, each tooth is progressively higher than the one preceding it. In this way, the edge of each tooth is able to take its share of the complete cut. The degree of taper of the broach, which is usually expressed in inches per tooth, varies according to the nature of the work to be broached, the length of the piece, and the style of machine on which the work is being done. The average taper per tooth is about .003 inch.

The style of broach used is very important. For example: in some cases it is highly desirable to nick the teeth of the broach, in this way assisting in breaking the chips. The amount of undercut on the teeth is often modified to insure a smooth cutting action, and so on. In fact, experience is a great teacher, and when in doubt it is good practice to put your problem up to the makers of the machine.

At the end of the tapered section of the broach, it is the usual practice to have about five or six teeth which are of the same height. Of course, the purpose of this is self evident, viz., to finish the surface that was roughed out by the last tooth on the tapered section.

As a general rule, the cross section of the broach is made the same shape and size as the outline of the piece to be broached, but in cases where the operation is extremely difficult, it is found advisable to use two or more broaches successfully. In fact, as many as a dozen broaches have been known to be used in some cases.

What work can be accomplished on such machines? To answer this question in detail is almost impossible in an article of this nature. Enough to say that there are some classes of work where broaching has proved very suc-

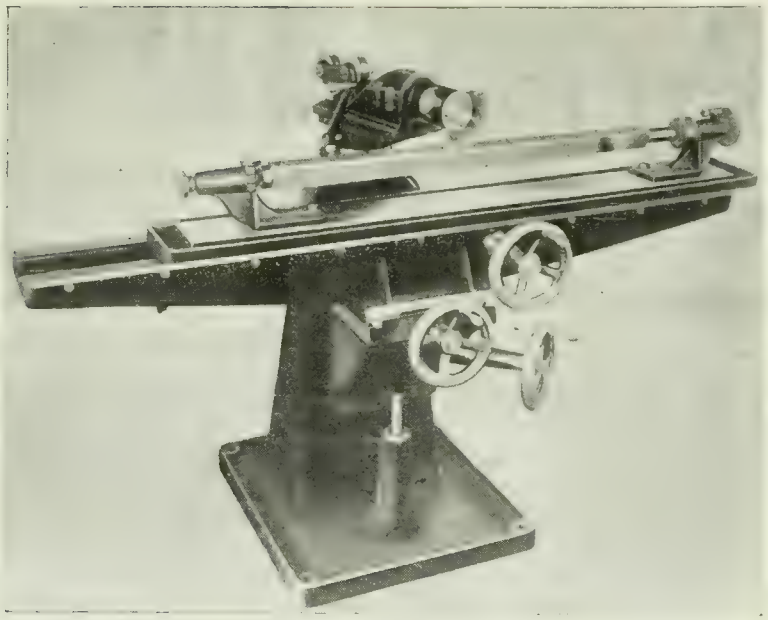


FIG. 2—THIS MACHINE WAS DESIGNED EXPRESSLY FOR THE PURPOSE OF SHARPENING BROACHES.

cessful. First let us consider internal work.

The cutting of keyways of all kinds; broaching of round, square and other special shaped openings; reamer broaching; wrenches; internal gears; grooves in various styles of work; splines; implement parts, and in fact any style of work that has a hole in it to be finished. The big point to keep in mind is productive time. Think of your present method, see if broaching can improve it, then use your own judgment.

Finishing external surfaces is, of course, the reverse operation, for, as explained previously, the broach in this case is stationary. However, it can be generally stated that former milling operations have lent themselves to this style of broaching, and serrated rolls on textile machinery have also been successfully finished by this method. However, as a general proposition, it is not feasible to make either internal or external broaches over six inches diameter.

Is Broaching Accurate?

The accuracy secured by broaching is largely dependent upon the amount of support furnished by the surrounding walls of metal at the points where broaching is being done. In any case of cutting of metal, there is always a tendency for the work to spring away from the tool unless it is prevented from so doing by some rigid means of support. The same condition holds good in broaching. The amount of distortion is often negligible, and in many cases too small to be of importance, but it is easily understood that the highest degree of accuracy cannot be expected, or obtained, if the support around the part being broached is not adequate. It has been proved, however, that where the work, or the work holding fixture, affords the correct amount of support, the work can be held to limits ranging from .001 to .002 inch, and a broach will cut several thousand pieces before it becomes worn enough to change results.

As conditions differ considerably in the cutting of various types of metals, it is necessary to use different coolants, or, as they are sometimes called, lubricants, in order to prevent excessive heating of the broach and work. The coolant also acts as a lubricant and helps to overcome frictional resistance and consequent wear. Cast iron and brass can generally be broached dry, and in some cases aluminum is also cut dry, although many claim that kerosene should be used as a coolant.

On steel of ordinary hardness, mineral lard oil is used, this giving a combined action of cooling and lubricating. On particularly tough work, such as alloy steel, etc., white lead slightly thinned with linseed oil or kerosene is generally used.

The No. 5 machine, as made by the concern we are speaking of, has a stroke of 96 inches, so it will be seen that considerable length of work can be accommodated. The No. 0 machine has a stroke of 21 inches. These figures will give readers some idea of the range. Experience has shown that when the heat treatment of steel has been conducted to give the maximum degree of softness, the best broaching results can be obtained. A scleroscope hardness of 32 to 40 is about right, for if the metal is any softer, it will tend to tear instead of cutting freely. On the other hand, steel of a greater degree of hardness than 40 will soon destroy the broaches.

Sharpening of Broaches

It is a matter of great importance to design the broach teeth in such a way that the cutting edges can be re-sharpened without reducing the diameter or size of the tool. This condition is obtained by leaving a land on the top of each tooth, so that when the cutting edges of the teeth become dull the front face of the same can be ground without affecting their size. It will be remembered that we have already mentioned that the last five teeth were of uniform size. As the sharpening continues from time to time, a point is finally reached when the height of the teeth begins to decrease with further grinding. The method adopted is next to start on the first of the five straight teeth, grinding this tooth so that it actually becomes the last one on the tapered section. By continuing this practice, the number of straight teeth is gradually reduced to one. When the land of this tooth has been ground away the broach has served its purpose.

However, the grinding of broach teeth is not such a task as it was formerly, for the company mentioned has produced a grinder as shown at Fig. 2, expressly for the grinding of broaches. It was originally designed for use in their own factory, but the demand became so insistent for a machine that would accu-

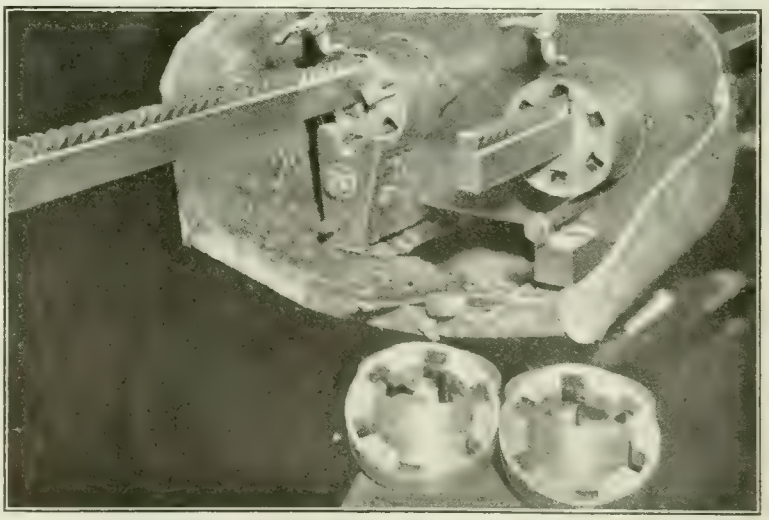


FIG. 3.—A DOUBLE BROACHING MACHINE CUTTING 216 SLOTS PER DAY.

rately grind the small and varying angles of broach teeth, that they issued it to the trade. As will be noted, it consists of a solid column supporting a vertically adjustable knee.

The Making of Broaches.

It is an open question whether manufacturers should attempt to make their own broaches. Some corners do so, while others order direct from the makers of broaches and broaching machines. Personally, my opinion is that it pays to get your broaches made by those who understand the subject best. On one occasion I remember disassembling a large clock for cleaning. After re-assembly I had various parts left over. The clock still goes—but not as good as it used to. The same applies to broaches. You may make a broach that will do the job, but are you getting 100 per cent. efficiency out of it? However, we are not going to enter into a discussion on the subject, so let us proceed to actual examples of work performed.

Examples of Work.

First let us consider Fig 1. Here is shown an example of spline broaching. The production on such work varies, of course, with the length and depth of cut, and it is often necessary to use a set of broaches to attain the desired depth. In this case a set of four six-spline broaches were used and the production obtained was ten finished pieces per hour.

The next example, Fig. 3, shows a double broaching machine working in a large factory at Philadelphia. The work being done is the cutting of keyways in female parts for alignment joints. Each part has six slots, and the production obtained is 216 slots per day. It might be well to mention that this output exceeded that obtained on a single machine by 80 per cent. These figures need no comment, as the significance is very clear.

Fig. 4 shows a real sized broaching job. This is accomplished on the No. 5 machine, and the operation shown is the broaching of 12 ⅜ in. by 14 in. grooves in a motor frame. These frames are 22-inch diameter, and through the use of 12 cutter bars, the twelve grooves are cut at one operation, the time per piece being only five minutes. The outer ends of the cutter bars are connected by means of radial springs that draw them to a common centre. The rear ends of the bars are cut away on the inside, so that, when the draw head is out ready for the return stroke, the cutters are drawn in toward the centre, clear of the work, which can then be easily slipped on or off the work holder or bushing on the faceplate.

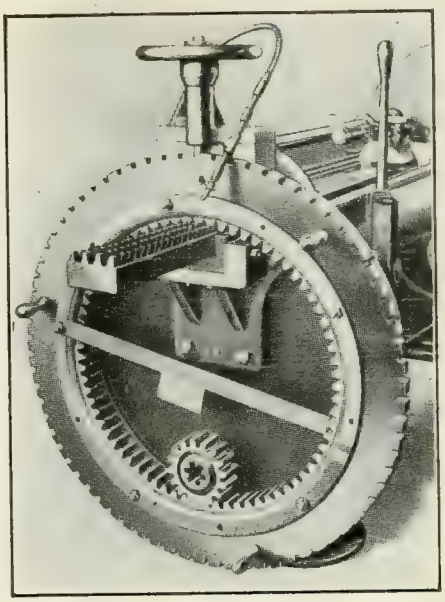


FIG. 3—A GOOD EXAMPLE OF INTERNAL GEAR CUTTING, USING A SPECIAL BROACH FOR THE WORK.

Fig. 5 depicts a fine example of internal gear cutting. This illustration shows a 22 in. gear, 3 pitch being broached. This job, although large, is completed on a No. 4 machine and, although the broaches and fixtures were rather expensive, the production obtained offset the first cost. On smaller work of this nature it is not only possible to broach all the teeth in one operation, but when the cut is comparatively short, two or three gears can be broached at one time. Of course, under such conditions, production soars, and in every case the gears are interchangeable. In a certain Detroit automobile factory internal gears 3½ in. pitch diameter, 1 in. thick, and made from 45 pt. carbon steel, are being broached at the rate of 12 per hour. This is only one case, but the production figures speak for themselves.

Fig. 6 presents an interesting piece of work. This shows a vise jaw weighing 90 pounds and having a hole 6x4½ inches to be broached. The weight of the broach used for this work is 265 pounds, and owing to its weight it is arranged with a shank on the rear end, which telescopes into a special rear bracket as shown. This bracket is securely fastened to the table, so that when the broach is disconnected from the machine it is supported in the bracket and can be rotated to clean out the chips.

After the vise jaw is slipped on the end of the broach for the operation, the machine is reversed, bringing the connecting bushing into the broach. The broach is then connected by means of a key, and the machine started for the operation. Before the shank leaves the support bracket the pressure is sufficient to hold the broach in position without the aid of the bracket. This work was done on a No. 4 machine.

Figs. 7 and 8 show two interesting jobs. The first of these illustrates the broaching of the tee slot in the breach of a U. S. naval one-pounder rifle. A set of ten broaches are used to complete the slot, and a production of one gun every hour and a half is obtained.

Fig. 8 depicts a former milling operation, that of broaching flats on a large shaft. The style of fixture used is self evident. Enough to say the work is being handled very successfully, although we have no production figures on this piece.

Let us next dwell on a few word pictures of production procured by the broaching method. On a double screw machine, connecting rods have been produced at the rate of 55 to 75 per hour, depending upon size, length of part to be broached, material, etc. In fact, with some arrangements, 100 per hour has been obtained, and as many as 20,000

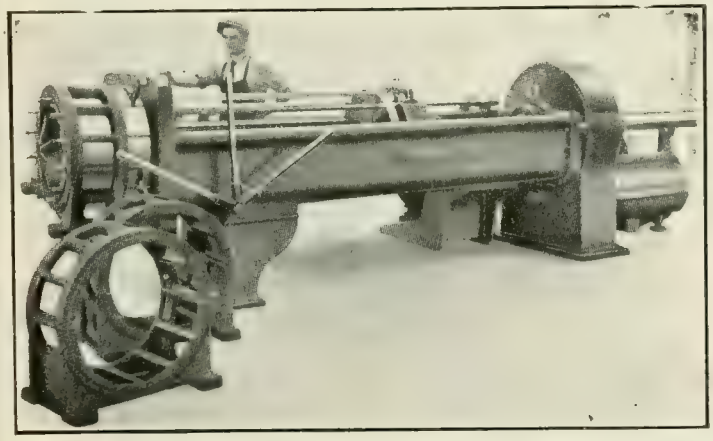


FIG. 4—BROACHING 12 SLOTS IN A MOTOR FRAME.

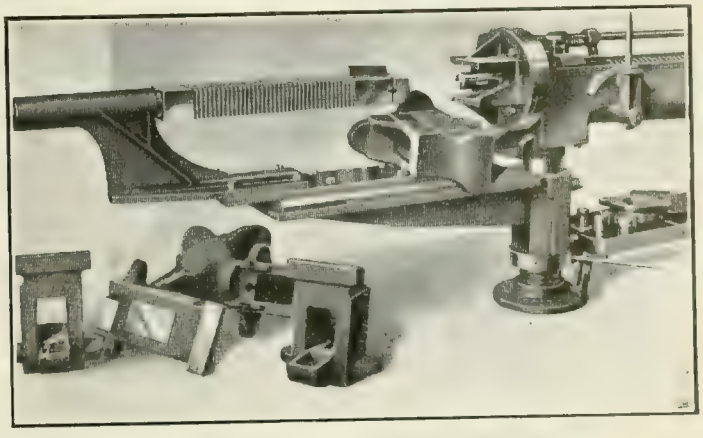


FIG. 6 BROACHING A 90-POUND VISE JAW.

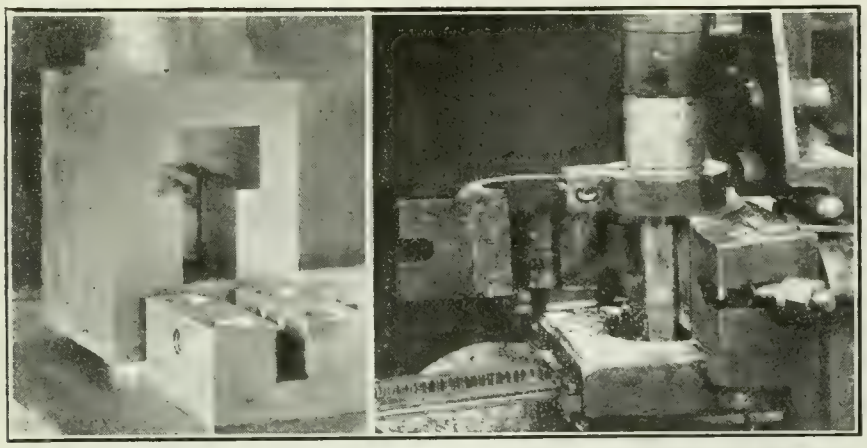


FIG. 7 LEFT HAND VIEW. BROACHING TEE SLOT IN NAVAL RIFLE.
FIG. 8 RIGHT HAND VIEW. BROACHING A FORMER MILLING OPERATION.

rods have been broached complete with one set of tools. The low cost under such conditions is readily understood.

In some plants, wrenches are being broached at the rate of 120 per hour, this figure being obtained easily, and with a very simple work-holding fixture. Automobile engine castings have also been broached very successfully; in fact, it is practically impossible to mention all the classes of work that can be broached, for new uses are being found every day.

At Fig. 9 is shown an interesting example of wrench broaching. These wrenches are broached from the rough forging, and the fixture holds eight pieces, these being all completed at one stroke. Stock to the amount of .062 in. is removed from the three jaw faces in this operation. The fixture consists of a profile projecting from a body casting to take the thrust of the broach and hold the wrenches in place. The wrench forgings, four to a side, bear against each other and are held toward the handle at each side of the fixture by two grooved sections, of which the upper is raised and lowered by a hand screw to permit the removal and the injection of the work. The broach rides in a guide and has its shanks milled away so that it is unnecessary to remove it when loading the fixture between cuts.

Allowing the machine operator as much as fifty-five seconds to unload and then put the eight new forgings in place —which is considerably more time than is consumed in actual practice—a production of 250 completed forgings is attained per hour on the single spindle machine for which the fixture was originally designed. The previous method of machining these forgings was by milling. It is claimed that the broaching method gives a considerable increase in production over milling, and that the desired accuracy is consistently maintained.

Fig. 10 depicts a lock broaching problem, and this concern gives us the following data relative to it.

Broaching Key Slots in Locks.

Broaching of the paracentric slots in lock plugs similar to those illustrated in the drawing is by no means a new machine shop operation. It was being successfully done at least a decade ago with vertical or push broaching machines, and before then, in one shop at least, with a rude make-shift, consisting simply of a belt travelling over pulleys to which the thin broaches were secured. But until now this rather unusual type of broaching has never been done on a horizontal or pull broaching machine.

The machine used, which is a special model of the Lapointe standard No. 1 machine, was recently built for one of the largest lock manufacturers in America. A second machine with full equipment for broaching key-recesses is now under construction for another lock manufacturer. The first of these two machines was guaranteed to broach a minimum of 100 locks per hour. This production has been easily maintained, and in fact we can now guarantee a production of 150 locks per hour on similar work. It is believed that this is considerably in excess of any previous output per man per hour.

Since, in broaching these irregular slots, it is necessary to start the cut on the external surface of the work, a positive means of holding the lock plugs as well as a rigid guide and support for the broach must be provided. The fixture is designed to hold two lock plugs and so supply two finished key-recesses after every stroke of the machine. Bolted to the main casting of the fixture are right and left hand locating blocks. At the inner edges of these blocks are bored recesses which hold the barrel-shaped work. Two clamping blocks to lock the work in place slide on the first-mentioned members. An eccentric shaft carried by the projection cast on the fixture head stands between the two clamping blocks. A turn of the shaft handle squeezes the work preparatory to broaching. At the end of the cut, the handle is again turned and springs drive back the clamping blocks and replace the work for removal. The fixture projects two feet from the face of the machine as a broach guide and is supported at its extremity by a rigid leg.

The Broach

Because of the extremely narrow cut, which is, as indicated in the drawing, but .056 inch wide at the least point, the broach for this lock work is an unusually delicate tool. The fragility of the cutting teeth made it impossible to cut as much metal per tooth as is customary in the ordinary broaching of the cylinder brass, of which the locks are manufactured. This greatly increases the length of the tool so that it was necessary to provide a broach 60 inches over all. The standard No. 1 machine has a stroke of but 46 inches, so a No. 1 machine bed 20 inches longer than normal was cast for this particular job.

The 60-inch strip of tool steel was cut into ten metal wafers of equal length in order to facilitate the machining of the cutting teeth. A broach body was built to carry the two series of cutter strips, each of which was securely locked in place by a taper block bolted to this tool body. Straight slots, curved

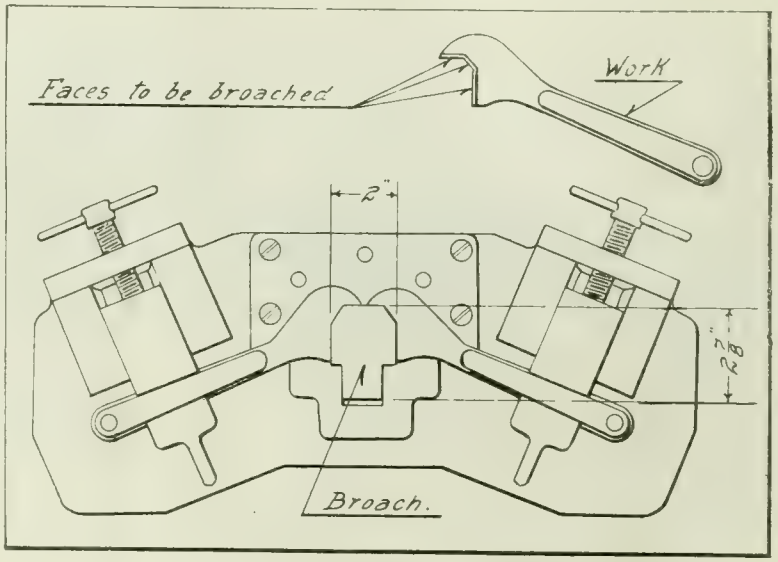


FIG. 9—AN INTERESTING EXAMPLE OF WRENCH BROACHING.

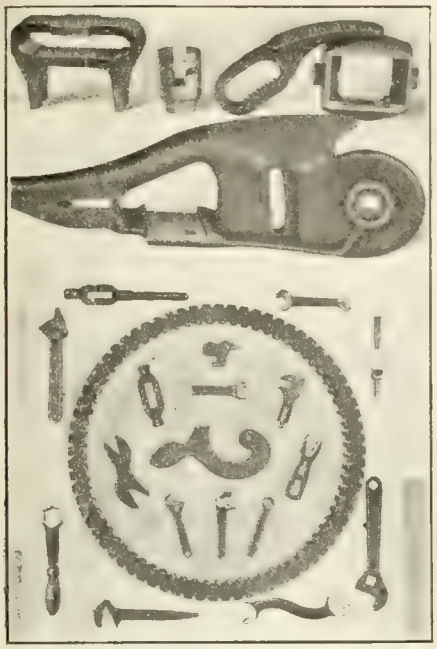


FIG. 11 TYPICAL EXAMPLES OF WORK SUITABLE FOR BROACHING.

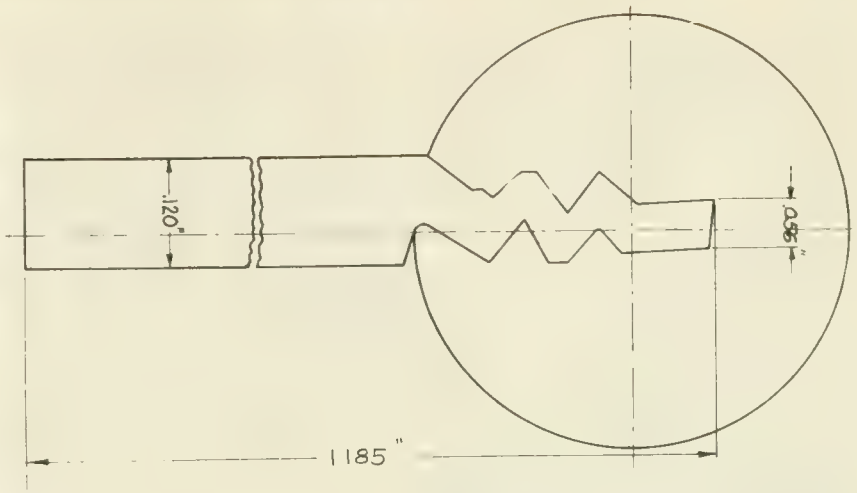


FIG. 10—SHOWING STYLE OF BROACH USED FOR THE KEY SLOT IN LOCK.

slots, and irregular slots of any kind, except those having 90 degree or near 90 degree corners, may be broached by this method.

Give Definite Information.

Broaching results are often handicapped by the foremen themselves, who, when desiring new broaches, write away for them, but do not include sufficient information. This condition also holds true in a more aggravated form in the case of ordering equipment for the first time, and there is no reason why executives in general should not include the information in the first place, thus avoiding delay. For example, suppose you want some cutter bars. You should then give the following information: Width of keyway; depth of keyway; diameter of hole; length of work; material to be broached; type and size machine on which tools are to be used; do you desire work bushing? what are the limits of accuracy allowed?

Suppose it is square broaches you desire, then mention the distance across flats; distance across corners; diameter of hole previous to broaching; is hole drilled or cored?; length of work; material to be broached; type of machine on which tools are to be used; whether pull bushing and guide is desired; limits of accuracy allowed, and number of pieces to be broached.

In the case of spline broaches, the last eight queries are the same, but in addition you should mention the number of splines; outside diameter of the splines, and their width. Whenever possible, include a blueprint of the piece. These instructions may seem unnecessary, but the amount of information left off the average inquiry for equipment prompts our emphasizing this point.

In conclusion, let us look at Fig. 11. Here are shown a few typical examples of work performed by broaching, and it must be considered that, after all, these are only a very few, but enough has been shown to illustrate the variety of work possible.

DATA ON THE SQUARE

RELATIVE AREAS OF THE SQUARE WITH OTHER FIGURES

Calculations based on a square of one inch on a side.

(1) A— —Area $= S^2 = S \times S$. $1^2 = 1 \times 1 = 1$ sq. in.
D— —Diagonal $\sqrt{S^2+S^2} = \sqrt{1^2+1^2} = \sqrt{2} = 1.4142$ in.

(2) Areas of squares vary as the squares of their sides or diagonals.
$A : a = S : S$ or $A : a = D : d$
A square 9 inches on a side is 9 times as large as one 3 inches on a side. $3^2 : 9^2 = 9 : 81 \quad 1 : 9$

(3) Diameter of circle of equal area.

$$\sqrt{\frac{S}{.7854}} = \sqrt{1.27324} = 1.1284 \text{ inches.}$$

(4) Length of side of square of 1/2 the area equals one-half the length of the diagonal $= \sqrt{(\frac{S}{2})^2 + (\frac{S}{2})^2} = .7071$ in.
Relative areas of squares, in the ratio of 1 : 2 may be obtained graphically as shown in (4) and (6).

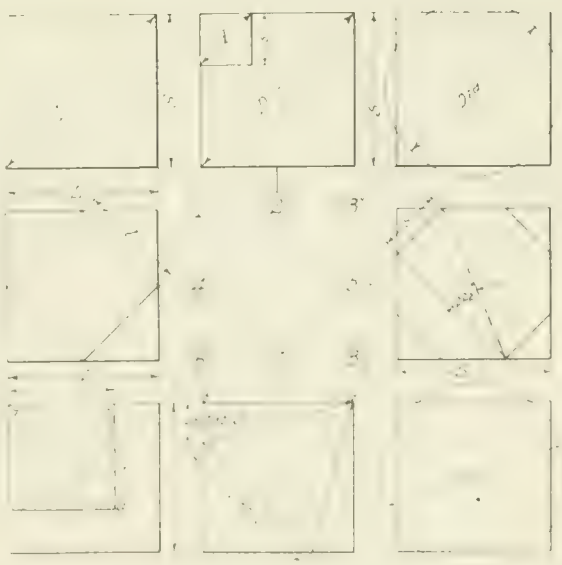
(5) Length of side (s) of octagon contained in square equals tangent of 22 1/2 degrees x S = .4142 x S = .4142 in.

(7) Length of side of greatest equilateral triangle contained in square equals:—

$$\frac{\text{Tangent of 15 deg.} \quad .26795 \times S}{\text{Sine of 15 deg.} \quad .25882} = 1.035 \text{ S}$$

(8) Diameter of circle, the circumference of which equals the perimeter of the square, equals: $\frac{4 \times S}{3.1416}$

1.273 S.



Canadian Machinery

SAVE THIS CHART FOR FUTURE REFERENCE. OTHERS ON VARIOUS SUBJECTS WILL FOLLOW.

Can We Lessen Vibration and Chatter in Tools

Chattering in Cutting Tools Can Be Avoided by Carefully Setting the Tools—Trailing Action is Thus Secured—Boring Bar Construction—Careful Tool Setting Will Assist Production

By F. HORNER

IF we take a lead pencil, hold it vertically, and draw it along the paper, as at A, Fig. 1, the result will be a harsh, chattering kind of action. But if the pencil is inclined, as seen at B, this vibratory influence will disappear, and the stroke will be smooth and sweet. This principle of setting the tip behind the centre or holding spot is applied in several types of cutting tools, and is advantageous because of the lessened vibration and chatter. It is only a question of radial movement of the point. Could everything be held perfectly rigid, including the work, the tool shank, and all the parts of the machine that hold and sustain it, the trailing action would not offer any advantage, but as there is inevitable spring and elasticity in most of the elements, the machinist has to circumvent the effects of this deflection.

Imagine our pencil directed forward, as shown at C, what happens is obvious. The resistance of the thrusting of the lead causes the body to bend, or the hand to give, and the penetration deepens, as indicated by the dotted curve. The centre, a, is represented in the case of tools by some portion which is the location of elasticity. In a planer or shaper tool box it is assumed to be the clapper-box pin for sake of demonstration, although other sources of weakness are the tool shank itself, the binding clamps, and the joints of the tool-box and saddle. Even the cross-rail itself may undergo torsion. In strict theory, therefore, the tool point ought

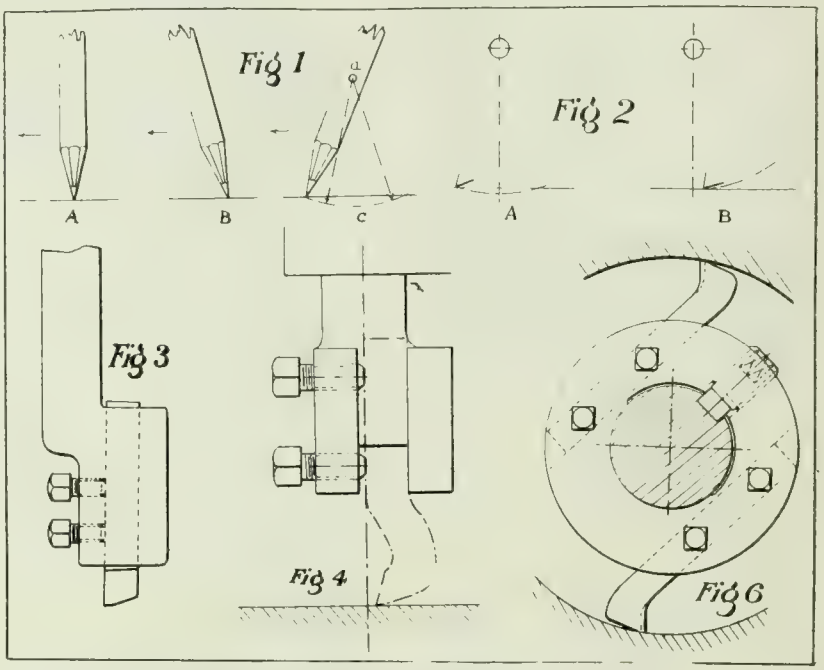


FIG. 1—DEMONSTRATION WITH PENCIL TO SHOW ACTION OF TOOL.
FIG. 2—TOOL SET BEFORE AND BEHIND PIVOT PIN.
FIG. 3—TOOL EDGE COINCIDENT WITH UNDERSIDE OF SHANK.
FIG. 4—BORING-MILL HOLDER CARRYING TOOL SLIGHTLY GOOSE-NECKED.
FIG. 6—SMALL BORING-HEAD WITH TRAILING CUTTERS. (The trailing cut.)

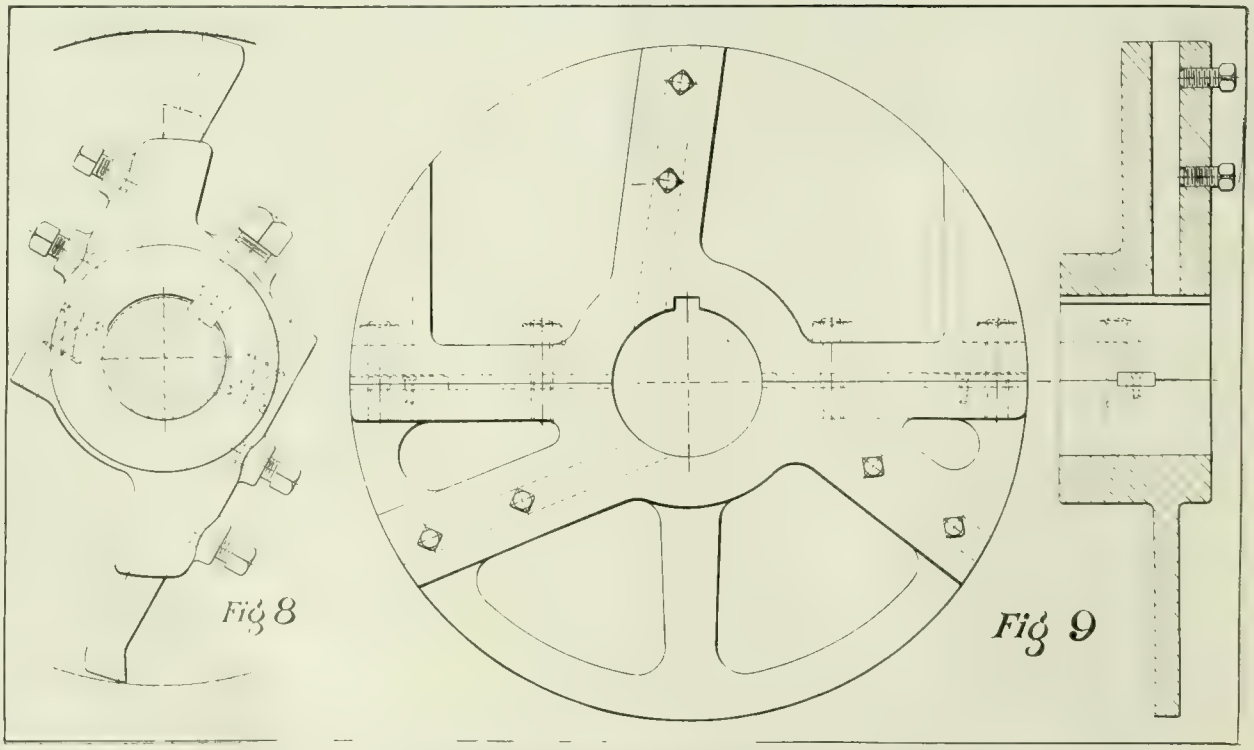


FIG. 8—LARGE HEAD WITH TRAILING CUTTERS AND END ADJUSTMENT.
FIG. 9—LARGE DISC HEAD WITH TRAILING CUTTERS.

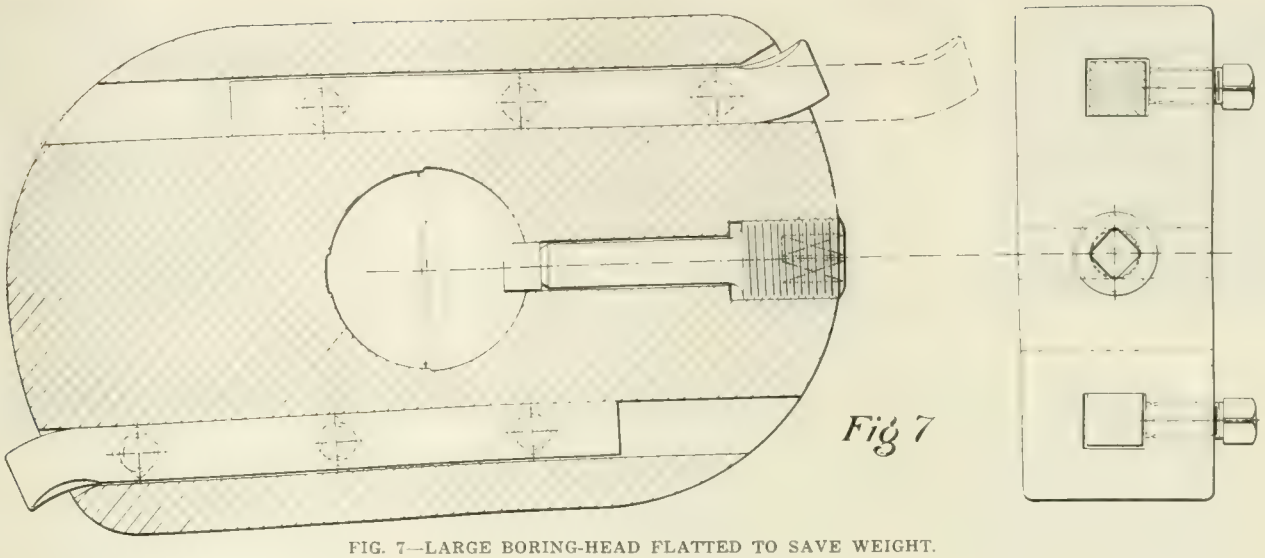


FIG. 7—LARGE BORING-HEAD FLATTED TO SAVE WEIGHT.

to lie back of all these elements, but as this is an inconvenient proposition, the pin is sometimes accepted as the pivotal centre. The tool point consequently instead of being set anywhere in front of the pin, see the diagram, Fig. 2, A, is located behind it, while B is located to a greater or lesser extent, dependent on the convenience of making and using a goose-neck solid tool or holder. This adoption of the spring principle does not necessarily imply weakness; the elasticity is there, but only for the purpose of preventing digging in, and is not comparable with the use of a spring tool of weak pattern that is employed for taking a very fine finishing cut. The only result of an attempt at heavy cutting with such a tool would be the continual evasion of cutting at every little lump or excess of metal.

An even and regular area of metal to be machined imposes little difficulty upon the tool operation, because the stress is constant and not subject to fluctuations inducing the tool edge to dip deeper at any particular spot. Such work, however, is rarely met with, as most pieces are of irregular surface, with swells and lumps, hard spots, and blowholes or other faults that cause variations in tool pressure. Hence, to relieve the machines, the tools, the work, and its fastenings of a great deal of strain and vibration, the trailing out is employed to a considerable degree, not only in planing and shaping, but in boring, and to a moderate extent in other processes.

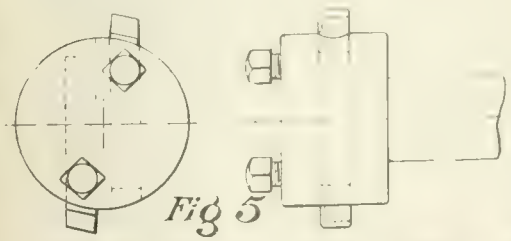


FIG. 5 BORING TOOL WITH CUTTERS BEHIND CENTRE.

As mentioned above, the approximate point of bending is not set down as a hard and fast rule, and a very general practice in regard to planing tools is to

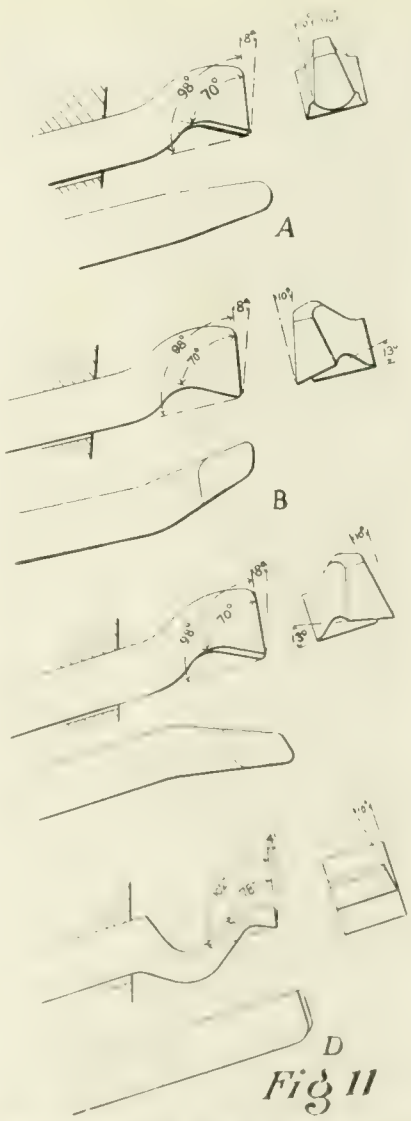


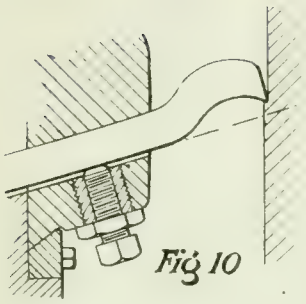
FIG. 11 STANDARD TOOLS FOR PEARN-RICHARDS MACHINE.

have the cutting edge thrown back to a distance equal to the thickness of the shank, a method that answers very well. This is also done with planing holders, such as Fig. 3, as well as with form and radius holders having flat cutters. As regards boring and turning mills, the difficulty lies in the fact that a tool must be prepared to work to the centre of the circle, hence a goose-neck shape would be inadmissible. What is done in this instance is to drop the seating of the holder back, see Fig. 4, so as to bring the face of the tool on a line with the centre. Then, if a trailing action is deemed desirable, one has only to crank a tool appropriately, more or less, such as suggested by the dotted lines in the drawing.

Boring Bars

Boring bars, from their unsupported nature, and often undue length, are particularly subject to chattering, especially as the bores are badly cored, with irregularities, lumps, blow-holes, and sometimes ports or other openings which cause distress to the tool edges. This question is frequently a matter of relative output, for a bar with non-trailing cutters might tear through a bore in a fashion, but leave it rough and irregular with numerous digs-in. This bore would cost more to finish smooth and true than one had been machined more efficiently with trailing type cutters. The conditions vary so, however, that no hard-and-fast rules may be laid down, results depending on the strength of the bar, the hardness of the material to be bored, and the depth and regularity of cut, combined with the feed rate.

The simplest type of construction for a two-cutter bar is that represented by Fig. 5 for bars of moderate size. The head being swelled permits of sufficient metal to accommodate the two shanks side by side. A similar idea is adopted in some kinds of adjustable blade reamers and boring tools, in which the blades are expanded or contracted by a threaded collar or other medium. When



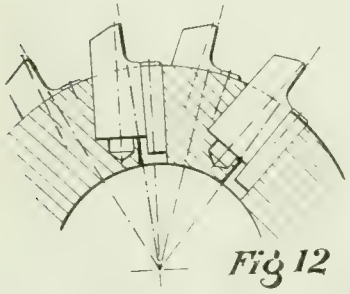


FIG. 10—ATTITUDE OF TOOL IN PEARN-RICHARDS MACHINE.
FIG. 12 MILLING-CUTTER TEETH WITH TRAILING ACTION.

a head is applied to a boring-bar and the trailing principle is desired, the cutter shanks must be disposed to pass alongside the bar, unless the head happens to be of unusual diameter. Three examples of differing designs may be noted in Figs. 6, 7 and 8. The first is suitable for diameters ranging from about 6 in. to 12 in., using heads varying from about 5 in. to 8 in.

Larger heads on this style of construction would involve unnecessary metal in the body, so lightening is done either by flatting the sides in the manner shown in Fig. 7, which provides very long life to the tools, by reason of their length, or by casting bosses on as illustrated in Fig. 8. This last design embodies adjusting screws behind the cutters, to set them and prevent slip. The top faces of the tools in these examples are ground either radial, or with top rake as required. Fig. 9 is a large disc form of head, in which the tools are set in trailing fashion. For convenience of placement and removal on the bar the head is made in halves, with a keyed and bolted joint face.

The application of the trailing cut to facing operations in the boring machines assists production, and the attainment of a good finish. In the case of the Pearn-Richards machines manufactured at Manchester (England)—on which Figs. 6 and 8 are employed—the face plate of the spindle carries a tool-holder or slide which can be fed across in either direction, propelling the tool gradually across the work face. The tool is held in the slide in the way given in Fig. 10. The formation of a few standard tools can be observed from Fig. 11, with top rake suitable for general purposes. The set comprises a straightforward tool, A, bent ones B and C, and a thin spring tool D, with wide face for the finer class of finishing.

With regard to inserted-tooth milling cutters, the conditions in these are not quite parallel with those of the tools previously considered. The amount of projection of the teeth is usually so little that the question of bending or springing hardly comes in. The endeavor to adopt the trailing action is sometimes made, with a view to securing a smoother cut, a specimen of which is offered in Fig. 12. The tooth faces are ground radial, but the tooth body is set behind the normal radial line.

NOTES ON GAUGING

Speaking on the subject of gauging, especially in regards to the Wickman type shown in this week's new development section, the Alfred Herbert, Ltd., have the following to say:

The manufacture of various components often calls for close limits, and in spite of the increase in the employment of limit gauges to ensure interchangeability of parts, the manufacture of the necessary screws for these parts is still carried on in a haphazard and rule-of-thumb manner. The screws supplied, as will be readily understood, have usually a short life because the importance of form of thread has not been fully appreciated. When replacement screws are ordered, it is usually found that they will not fit without resort to "die-ing" down.

It would appear customary for manufacturers to set up their screw machines to components; this results in an unsatisfactory state of affairs. The component itself is a variable in that its tapped hole will vary in size between limits. The screw machines are allowed to run thus set up, until the assembly shop reports that trouble is being experienced in fitting screws in the holes. By this time the screw machine is some days ahead in production and all the screws which have been made in the interim require hand sizing.

The shape of the threads not being controlled, there is a tendency amongst automatic setters-up to use dies, which produce extremely thin threads, i.e., threads of low effective diameter, thus protracting the periods between setting up. Even if the screw becomes slightly larger on the major diameter due to wear in dies, etc., it can be forced into the hole with a screw-driver, as all the pressure is taken on the tops of the threads themselves, which, being thin, are easily crushed down.

It is not often realized that the more care that is taken by manufacturers to maintain the correct shape of the thread (a necessary condition for screws which will be a good fit and have a long useful life) the more difficult it is to maintain interchangeability. Thus one occasionally hears the argument that interchangeability threads can be produced without gauges. The thread thus produced under such conditions has the effective diameter considerably below the nominal, with a very low mechanical strength and a short useful life. Many manufacturers check their bolts or studs by a micrometer reading on the major diameter regardless of the importance of pitch or effective diameter. These screws have only to be inserted or withdrawn several times to produce a bad fit.

To remedy this state of affairs, attention is directed to the following general principles. The automatic machine should be set up to pass a standard thread gauge, preferably a gauge which will be of a limit type. The gauge itself should be periodically inspected for size, and any error due to wear of more than a predetermined amount should not be permitted, depending upon the pitch of the thread and the use to which the screw is put. The component itself should be tested by means of a plug screw gauge which should also be periodically inspected. This procedure certainly entails a new overhead charge, but the finished article will be superior in quality and will be cheaper in the long run due to elimination of fitters' work on screws. It is futile to produce screws on the machine if 50 per cent. of the output needs re-sizing later by hand.

The ring gauge has undoubtedly been a constant source of trouble to users. It labors under a number of inherent disadvantages. It is very costly to make; it is difficult to check its size when made, and the periodic inspection of it becomes a laboratory process. If the article does not screw into the ring there is no clue as to what is wrong; if it does screw in, there is no guarantee as to the kind of fit, since a ring will pass a screw of exceptionally low effective diameter (i.e., with wafer-like threads) without shake, provided the major diameter is a good fit, or due to big pitch error in the screw.

Next to accuracy of pitch the most important element of a screw is the effective diameter, which is the measure of useful life and mechanical strength. The major and core, provided the error in them is not too great, can vary to many times the limit that could be allowed on the effective diameter, and yet produce an efficient screw, if the gauging equipment is such that it will not permit the major diameter to be larger than nominal or the core shallower than nominal, and so produce interference.

From the foregoing it will be obvious that a gauge, the tolerance of which on the effective diameter can be fixed to a predetermined amount, will be a great advantage. This effective diameter must of necessity be lower than nominal. Any screwed product has an error in pitch; it would not be a commercial proposition to produce one with an error sufficiently small to be called negligible. Any particular error in pitch increases the nominal effective diameter by four times pitch error. For example, if a screw has a pitch error of plus .001 inch its effective diameter will have to be lowered by .004 inch in order to assemble in a gauge (the pitch of which would be accurate to about .0001 inch).

WELDING AND CUTTING

Electric Arc Welding Applied to Aluminum*

Three Ways of Dealing With Oxidation—Current Necessary When Welding Iron or Steel—Necessity of Flux Coating and Other Points of Interest

By F. J. HEYES

EVER since the discovery of aluminium the greatest difficulty has been experienced in joining pieces of it together, either by soldering with some other metal or alloy, or by autogenous welding.

The first and greatest difficulty to be overcome is the affinity of aluminium for oxygen. In order to get any two pieces of metal to unite, it is essential that the surface should be free from any coating of solid dirt or oxide which will prevent them coming into intimate contact. The affinity is so great that even at ordinary temperatures a clean surface quickly becomes thickly coated with oxide, and at temperatures approaching its melting point it immediately becomes thickly coated, and small pieces of the metal will burn away completely. The melting point of the oxide is far above that of the metal, so that it is impossible to weld two pieces together without some flux which will dissolve or get rid of the oxide.

With a plain aluminium rod without any coating of flux, on striking the arc the metal, instead of dropping off as soon as it is melted, hangs in globules on to the end of the electrode, till they become as much as half an inch in diameter, when using a number of electrodes; they then fall on to the plate which is to be welded. These globules become thickly coated with oxide, and so does the plate, so that when they drop off they adhere to the plate only at the point where they are playing, and when cool they can be easily pulled off with the fingers. All the time that this is taking place thick clouds of fumes are given off, and eventually the pieces of aluminium which were to be welded melt, but show no signs of adhering to one another. The thick clouds of fume are probably due to the fact that some of the aluminium is vaporised by the intense heat of the arc, and burns away much more freely.

*From "Mechanical Engineer."

Three Methods

There are three ways of dealing with the oxidation: First, by protection of the surfaces from contact with the air and consequent oxidation, by some flux which fuses easily and will not prevent the surfaces coming together. Secondly, by solution of the infusible oxide in some fluxible substance which does not affect the quality of the weld; and thirdly, by chemical combination of the oxide to form some substance which is fusible at the temperature of melting aluminium, or a combination of these may be used.

Perfect protection of the surface cannot be obtained in practice, so that it is necessary to combine protection with solution in one form or another. Chemical combination has the disadvantage that any substance that combines with the oxide will also combine with the aluminium, and so may be used up before dissolving all the oxide, or portions of it may become embedded in the deposited metal and cause subsequent corrosion. Hence, solution of tin oxide in some solution which is chemically suitable when in contact with aluminium is the best method, if obtainable.

Chlorides of the alkaline metals are very suitable for the protection of the molten surface from contact with the air, as they melt below the melting point of aluminium and do not interfere with the making of the weld. Fluorides of the alkaline metals and of aluminium have the property of dissolving aluminium oxide without chemical combination, so that they would appear to be the most satisfactory if there were no other obstacle to their use. Bisulphates of the alkaline metals, being unsaturated compounds, can combine with the oxide, and are very useful for this purpose.

Arc welding of aluminium has been attempted by the author, using the ordinary acetylene welding fluxes, without any success whatsoever, and he reached the conclusion that it is essential to use a flux which is not easily vaporised. For this purpose he found cryolite suitable. In arc welding a small pool of molten aluminium is formed at the point being welded, the temperature of which is far above the melting point of the metal, some of the aluminium being deposited in the form of vapor. At this temperature the cryolite becomes quite fluid, and runs freely on the surface, enabling a very good weld to be made. In trying to weld with a plain electrode the aluminium hangs in globules at the end of the electrode, as already explained, and there is still a tendency for this to occur when using cryolite alone. A small percentage of chloride, however, overcomes this difficulty and renders welding easier.

Flux Coating

In arc welding it is essential to have a coating of flux on the outside of the electrode, as otherwise the aluminium in passing from the end of the electrode to the work becomes so thickly coated with oxide that a very large quantity of flux would be required to deal with it. Where the electrodes may be subjected to rough handling it would be very desirable to have the flux enclosed in the electrode, but as this is impossible, it becomes necessary to fix the flux on the outside of the electrode, which may be done satisfactorily with a binding of fine cotton.

In welding iron or steel a current of about 80 amperes is required for a plate about ¼ in. thick, using a No. 8 electrode, but to weld a similar sheet of aluminium satisfactorily it is necessary to use about 150 amperes. The only explanation offered for this is that aluminium is a much better conductor of heat than

(Continued on page 43)

Tools Used in the Machining of a Roll Carrier

Four Operations Necessary, viz.: Three Milling and One Drilling —Fixtures and Cutters Used—Advantage of Adapting Finished Surfaces as Locating Points—Simple Fixtures Are Used

By F. SCRIBER

SOME interesting tool set-ups that have been developed in connection with the manufacture of the part illustrated by Fig. 1 are described in this article. The part to be machined is made of cast brass, and a few dimensions showing its general proportions can be noted in the sketch. On account of its frail construction, it would be very easily broken if made of cast iron, so that brass was the best material, insomuch that no great strain is placed upon it, brass being sufficiently strong for the work it had to do. The piece forms a part of a textile machine for carrying two rolls, one at A and the other at B, said rolls being used to transmit motion from a cam to an oscillating arm, and the operations performed in connection with this were, first, milling across the bottom indicated as X, at the same time finishing the sides along the bottom; and second, milling inside of the large bosses A. The third operation is milling the smaller bosses B, while a fourth operation is necessary for drilling all holes in the carrier.

The fixture in which the milling of the bottom was performed is known as the gang fixture, and in it two rows of the parts are set up. The fixture is made to carry a number of parts set end to end, thus utilizing the entire capacity of the machine for what proves to be practically continuous milling. This fixture is shown in Fig. 2, while a gang of cutters used with the fixture is shown in Fig. 3, this consisting of two combined side and surface milling cutters located the correct distance apart on an arbor with spacing collars.

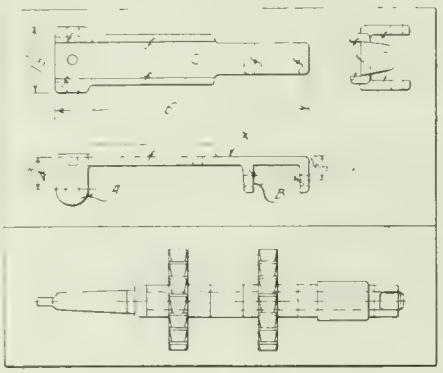


FIG. 1—UPPER VIEW, SHOWING THE ROLL CARRIER.

FIG. 3—CUTTERS USED FOR MILLING THE BOTTOMS.

Referring to Fig. 2, A is the base of fixture which is made of cast iron; the carriers are located on steel seats B, which are screwed and doweled to this base. Other steel blocks C are used to locate the work endwise, the two small bosses on the work being set over these blocks to accomplish this. Other blocks E are placed between each two pieces and against these the work is clamped sideways by means of two clamps F and G, which are caused to operate by draw bolt H when nut I is tightened, thereby drawing the two clamps together. Similar sets of parts throughout the entire length of the fixture hold other parts in place, and the fixture itself is clamped to the table of the miller (which is of the horizontal type). The operation consists of setting the work on a block, locating it endways between the bosses, and clamping it sideways against a centre block. These side-clamping members are made slightly under cut, so the tendency will be to draw the work down against its locating seats.

A rather simple fixture is shown in Fig. 4. This is used for holding two parts while the large bosses are milled inside by a side milling cutter of the correct width. In operation, two parts with the large bosses at centre of fixture are set on a steel block A and are clamped in place by a large strap B, which is forked so that the cutter can drop between it, thus milling the bosses. Nut C tightens the clamp, thereby holding both parts, and a spring D under the clamp raises the same clear off the work when the nut is loosened, thus permitting ready removal. The base of the fixture E is made of cast iron and is located in the tee slot of the milling machine by tongue F, it being obvious that advantage is taken of the finished portion, machined in the last fixture, for locating the work sideways. The vertical feed on the horizontal milling machine is used for performing this operation, the cutter being fed into the bosses the required depth, following which the table of the machine is fed horizontally, just sufficient to mill the bosses.

Again taking advantage of the finished seat on the bottom of this roll carrier, two small bosses X, Fig. 5, are next milled inside, using a cutter which will mill them the required width. This fixture has a hinged cover A, and the fixture is made to hold five parts. The base of the fixture B, which is cast iron, has a steel blank C screwed and doweled in position as shown. Five parts are

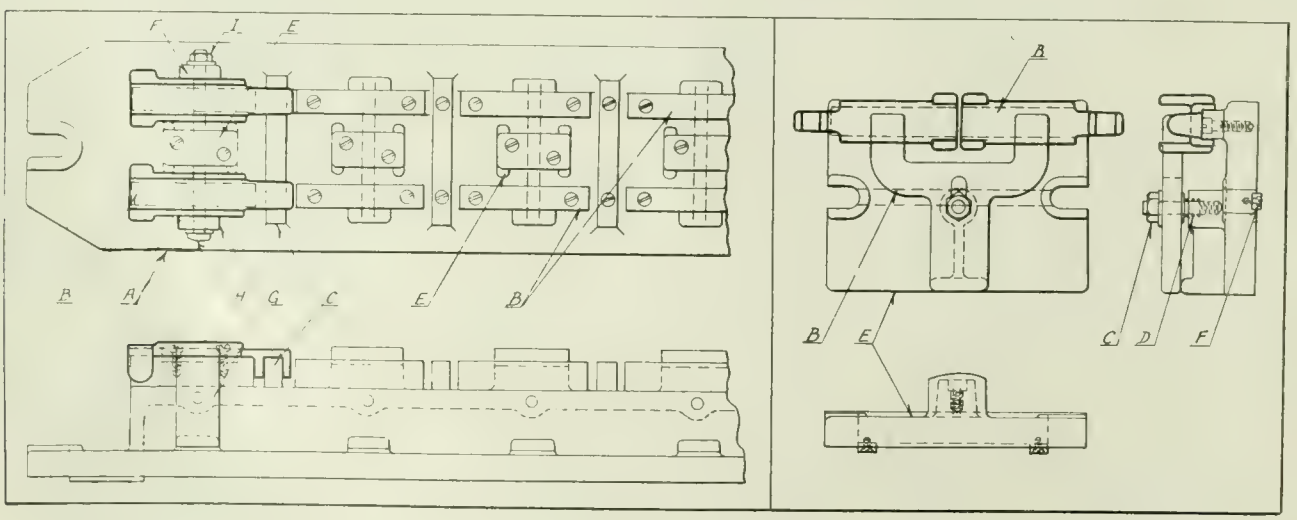


FIG. 2—FIXTURE IN WHICH BOTTOMS ARE MILLED.

FIG. 4—FIXTURE FOR MILLING INSIDE OF LARGE BOSSES.

put on each of these blocks with the hinged cover A swung back clear of the fixture, said cover pivoting on hinged pin D. Following this, the hinged cover is swung into position as shown and is clamped by means of the hinged bolt E which carries a nut and washer; this bolt pivots on pin F. Each part is forced against the hinged cover at the side by means of set screws G locating from the outside of the bosses at X. A series of set screws H, carried in the hinged cover, clamp the work down on the steel seats. It will be seen that this arrangement permits of holding the work securely in place and locating it sideways and endways in a substantial manner while the cut is taken between the two bosses. Although the milling machine was used for this particular job, the same arrangement permits of machining on either the planer or shaper.

In the fixture shown for the first operation, Fig 2, the method of operating it is to load the first four pieces in place, after which the feed on the machine is thrown in, allowing the cutter to traverse across the work. The operator then puts other parts on for the entire length of the fixture as fast as practical and, after the fixture is completely loaded, starts to remove the pieces machined. This can be done quite conveniently, as two parts only are held by one set of clamping units; thus almost continuous operation of the machine is obtained.

The concluding illustration, Fig 6, is that of a drill jig. There are six holes to be put in this piece, one in each boss and two others in the bottom. In this jig A is made of cast iron, and carries a steel cover B, which is hinged on pin C, and is locked in place by quarter turn screw D. When putting the work in position the cover is swung clear of the jig, while the work is located on a steel block E, this block being similar to those used on the milling fixtures. The large bosses are slipped under a steel plate F, which is held to the body of the jig by screws and dowels. This plate contains a bushing G for making one hole through the bottom of the roll carrier; two bushings H and I are contained in the sides of the jig for guiding the drills which make the holes in the large bosses. A bushing J at the opposite end guides the drill that comes through the outer small bosses, while a block K is attached to the hinged cover of the jig by screws and dowels and is used for locating the work endways as well as guiding the drill through the other small bosses, the operation being to put the work in with the cover back, swing the cover over and locate the two small bosses between block K.

The hinged cover is then locked by turning the quarter turn screw D, and a set screw L carried in the cover is employed to clamp the work on the steel seat E, while the other drill guiding bushing M is contained in the cover. This jig is machined on its four sides, two ends and bottom as indicated by marks, so it will be true in the various planes from which the work must be drilled.

All of these tools are economical inasmuch as they are so simple in design. They hold the work substantially and carry at one setting a sufficient quantity of parts so that the operation keeps the operator busy while enabling him to keep the machine cutting almost continuously. In the case of the first operation, one fixture and machine was operated, and when using the second and third operation fixtures, the operator runs two machines while the drill operations, being short, require all the operator's attention.

ELECTRIC ARC WELDING APPLIED TO ALUMINIUM

(Continued from page 41.)

iron, and as it is necessary to keep the pool of metal at the point being welded well above the melting point it is necessary to use a much higher current. When the plates being welded are cold it is impossible to weld with a smaller current, but if the work be preheated to about 400° C., a good weld may be made with about 60=80 amperes. This bears out the above explanation. As the melting point of aluminium is only 500° C., it does not require so intense a heat to keep the point being welded above this temperature if there is only about 180° C. difference between it and the surrounding portions of the material.

The welding current should increase with the thickness of the plate; for ⅛ in. thickness 120=130 amperes is required; for ¼ in., 140=150 amperes. The reason for this is that with a thick plate there is a greater area to conduct away the heat from the molten pool under the electrode than there is with a thin one. In welding a very thick plate a condition is reached where heat is conducted away from the greater part of the surface of a sphere of which the point being welded is the centre. For plates thicker than that corresponding to this condition no increase in welding current is required.

The possibility of producing a pool of metal well above the melting point at the spot being welded without heating up the whole plate to the melting point is one of the great advantages of arc welding over oxy-acetylene welding. In work which has been welded with the oyx-acetylene flame it is frequently found that the pieces have run together only on the surface, as if the operator attempts to melt the aluminium to a greater depth a large portion of the work may be melted out. This is not so likely to happen when using the electric arc, as the heating effect is much more local.

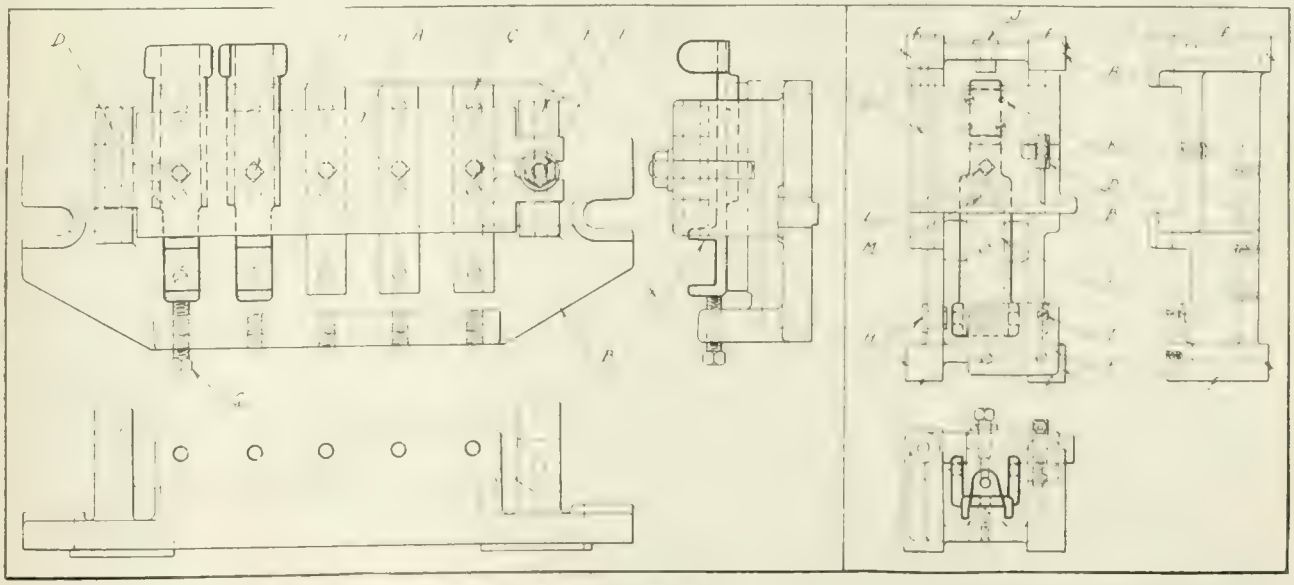


FIG. 5—FIXTURE FOR MILLING INSIDE OF SMALL BOSSES.

FIG. 6 DRILL JIG FOR CARRIER.

WHAT OUR READERS THINK AND DO

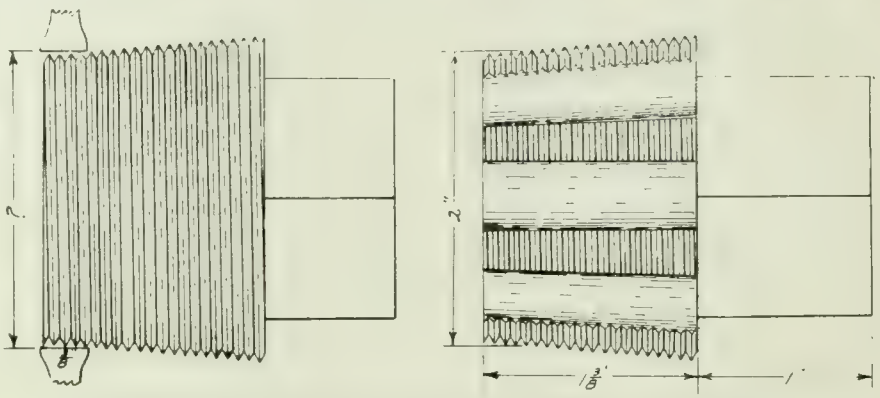
LOCOMOTIVE BOILER MUD HOLES.

By H. BAILES.

Anyone familiar with the present method of gauging these mud holes with a plate knows that this system is inaccurate. First of all, dirt and rust adhere to the threads, and secondly, the plate only measures the bottom of thread on plug. In the rush of making a speed "test out," quite frequently the taps are not put in these holes to clean out or straighten up the threads, with the result that many plugs are blowing steam when the engine ought to be leaving the shops.

After tapping all the holes in a boiler, the writer has used with good success a set of old plugs for the purpose of gauging the size of these holes. The plugs are from 1⅞″ diameter to 2½″ diameter, these increasing by 1-16″, this making eleven plugs to the set. The size of the plug is determined by calipering the fourth thread from the end, i.e. ⅜″ from the end, or the width of a pair of outside thread calipers.

Each plug is stamped on top as follows: 1-7, 1-15, 0, 1, 2, 3, 4, 5, 6, 7, 8; 0=2″ diameter, and the whole numbers above this signify 1-16″ increase in diameter. No. 3 represents 2 3-16″ diameter; No. 4, 2¼″ diameter, and so on. Below the cipher No. 1-7=1⅞″ diameter; 1-15 1 15-16″ diameter. In use, the practice is to chalk above each hole the number of the plug used. Thus, the abbreviated method of marking comes in very handy.



THE TEXT EXPLAINS FULLY THE IDEA. READ IT CAREFULLY.

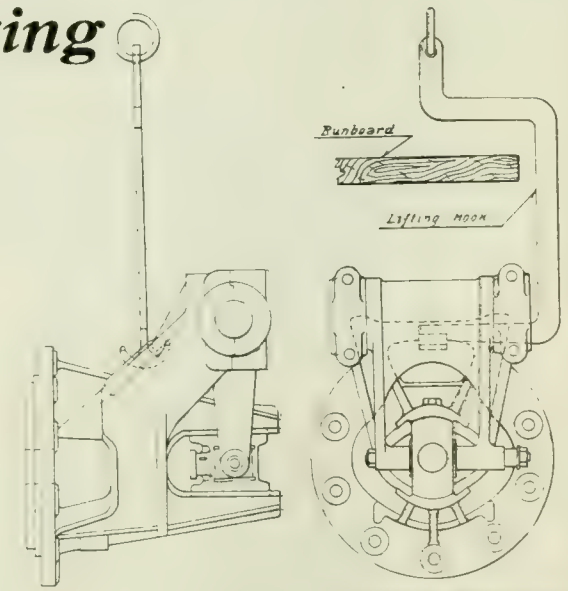
In some cases a plug may enter three or four threads only. For example, suppose this happened with a number four, or 2¼″ diameter plug. A No. 3 plug would enter this same hole to within four or five threads of the top. What would be the size to take? In such an instance, the mean diameter or 2 7-32″ would be correct, the hole to be marked 34, signifying the diameter as being the mean of these two sizes. Thus, 56 would equal 2 11-32″; 1-31 = 1 31-32″, etc. From past experience, I found these sizes comprise the standards excepting inspection holes and one or two isolated cases, viz.: 1⅝″, 1¾″, and 1 13-16″ diameter, which may be determined by inside thread calipers.

Now, substitute taps for the plugs, i.e., plugs duplicated in hardened steel, and milled with teeth for cutting purposes. The mud holes of many boilers vary from three to four sizes, so it is merely a question of measuring one hole with your scale and securing one or two plug taps above or below the size measured. By this method you are sure to use the

Lifting Tackle for Erecting Shop

The drawing illustrates a lifting tackle designed for use in locomotive erecting shops for removing or installing combination back steam chest covers to cylinders, where, owing to the confined headroom difficulty has been experienced in placing covers in position. The old method—a dangerous one—was to use a bar in conjunction with a chain hanging from the crane, requiring three men and a slinger for the purpose. The hanger here shown is in the form of a U-hook, designed to clear the running board and still give a direct lift. Hook is arranged for right and left hand lift, tip of the hanger gripping the edge of the opening in the top of the cover, where the latter is perfectly balanced. With this device only one man and slinger are required, and danger of accident is eliminated.

By F. C. H.



taps, and besides, these taps are more effective, to my mind, in tapping new holes than the usual long standard tap.

The method of using old plugs is also expensive and inaccurate, the process being to anneal them before sending to the lathe. The lathe hand has plate sizes for one set and proceeds to chase the threads up with a hand chaser. In many cases the plugs are returned with a taper which does not correspond to the hole. In conclusion, I would suggest a set of adjustable dies, graduated similar to the plug taps, of the same taper and pitch, so that the old annealed plugs could be rethreaded by unskilled labor, using an old drill head.

TWO STORIES OF INTEREST
By D. A. HAMPSON

Two of our planers ran continuously on "51-inch plates," as they were known in the shop. These were castings about six feet long that were made from patterns 51⅝ inches wide, which gave us ample to face to an approximate width, and also allowed plenty of clearance on the machines. One planer was a 54-inch, the other exactly 52 inches between uprights, and on this latter we had to centre our castings pretty evenly to clear.

We drilled three holes in each end for finger clamps and these clamps very nearly centred the pieces. Then, before tightening the bolts, the planer hand would check up with his scale to see how even the casting was with the edge of the table, shifting if need be to "divvy" any irregularity in width. We knew from experience that this setting would pass the uprights of the 52-inch planer—so the operator's procedure was to immediately start the motor, give the reverse lever a kick and bend over to set his cut.

He was bending over to set his tool in the work one April morning, when, presto! The gears emitted a sound of heavy pulling, the forward belt slid off and the table stopped—with half the length of the casting under the rail. Stuck! A swell in the casting, such as we had never known before, had blocked it completely.

Try as we might, we couldn't get that casting free. We even blocked up our twenty-ton jack and tried to push the casting ahead on the table. Nothing doing. The machine was a heavy switch and frog planer with a good 20 horsepower motor behind it and it had a full measure of driving power. We might have loosened the casting by the battering ram method, but this would have ruined it, at the cost of $150. Finally, we had to remove the cross rail and then we were able to shove the off-side upright away enough to free the plate. Needless to say, we never trusted the size of a casting again.

Another Peculiar Case

Quite different from the planer event was one met with on an outside job. Our town owned a stone crusher which had been situated on the north road for ten years past. A better and cheaper supply of stone was offered at the opposite end of the city, and, as there were other advantages, it was decided to move the crusher plant to the new location. Our shop had the job of taking the machine down and setting it up again. Jim Muir, the old Scotch truckman, who did most of the heavy moving locally, was to transfer the parts as fast as we got them disassembled.

The crusher was not of the portable type—the big base casting was firmly set and bolted on a massive concrete foundation. The base was planed flat on top. On this base was bolted the heavy frame of the machine itself. We had taken off the flywheels and other assembled parts and had only to get the frame loose from the base, to take the nuts off the foundation bolts, and half our job would be done. But on outside work, it is never safe to cry "Finished" until you get back to the shop.

We took out the bolts all around, and so far as we could see there was nothing more to hold the frame to the base, so we had the boys give her a pry with the bars. That did not do and we took another look around to see if there was a bolt we had skipped or a dowel covered up with paint. There was neither. We had our fifteen-ton jack along and that made us feel secure against any little thing like a rusted fit. This jack was placed with its head under a friendly hub on the frame and one of the boys told to hurry up and pry her loose. He was a rugged lad but he called for assistance after one perplexed effort. Three men on the bar failed to raise the offending casting and the boss said to go home for the day while he thought it over.

Next morning we rigged up a gin pole over the crusher. From this we hung one two-ton and one three-ton chain hoist. Slings from these were passed around the frame.

Then each hoist was manned by three men, and three men were put on the lifting jack. At last we were really armed to attack this obstinate four-ton casting. The boss gave the word and everybody strained. Nothing doing. We tried again and again with the same result.

Sweating, the boys stopped long enough to give vent to some strong language. We had done our best and lost. The only solution we could offer was that there were tap bolts up through the bottom, but that didn't seem possible either for they couldn't be put in unless there was a pit under the base.

Just then Mr. Muir appeared with the heavy wagon to take away the piece we could not loosen. He asked to see us try it once more, and we went through the same humiliating performance. "Well, boys," said Jim, "you've done all you could do and it's not enough yet. Now, just for luck, let me take that twenty-pound sledge and tap around the bottom while you give her one more pull —as long as you've got everything rigged up, I'd like to try a few blows while you put a strain on."

And we learned something right there for at the fourth swing of the sledge—snap! That frame came loose just as nicely as anyone could ask. There was nothing but weight and rust holding those two flat surfaces together. But we had been treated to a demonstration, not soon to be forgotten, of the fact that a blow applied to a part under stress has wonderful effect.

STRAIGHTENING ROTOR SHAFT
BY JOHN S. WATTS

I read with interest the article on straightening of rotor shaft on page 47 of Feb. 10th issue of Canadian Machinery. I noted that the editor questioned the method employed, because as he expressed it, the method adopted did not relieve the internal strain in the shaft caused by the bending. He suggested that the shaft should have been heated by a blow torch, straightened by pressure, and after being annealed at a dull red heat, trued up in the lathe.

As the bending of shafts and other parts, by rough handling in transit, or by accidental over-strain in operation, is of fairly frequent occurence, I think it would be valuable to have this matter well discussed, in an effort to determine the one best method.

That it is impossible to get a bent shaft exactly straight again, by pressing out the bend, is well known to all who have tried it, and is apparently not disputed by the editor, who specifies trueing up the shaft in the lathe, as the final operation in his criticism. To do this means turning enough off the shaft, to permit the insertion of a bush, of a practicable thickness, in the bore of the pulley, to make it fit the shaft after it is trued. The bush would have to be at least an eighth of an inch thick, thus reducing the shaft one-quarter of an inch in diameter, and seriously weakening it at the point of greatest stress.

Possibly this reduction of diameter could be made just sufficient to true up the shaft by making or purchasing a new pulley to suit, but as these motor pulleys are finished all over and balanced, on account of the high speeds they run at, in nearly all cases the delay incurred in getting a new pulley with a special bore would be fatal. Experience in straightening shafts will show that in straightening out the one bend we infallibly cause another small bend, which in this case would occur in the bearing, and for a good job we would have to true up the shaft at the bearing, and so be compelled to also re-babbitt the bearing.

The main point the editor makes is that the shaft is under the permanent

initial strain imposed when bent, and that this strain is not relieved by the heat of welding. In a long experience I have seen many bent parts straightened, mostly always cold, and have never seen any annealed after straightening, nor have I ever known any failure from this lack of annealing. It seems to me that practical experience proves that a slight bend which gives no indication of having been sufficient to impose a stress approaching the breaking stress, while it undoubtedly must have strained the shaft beyond the elastic limit does not actually injure the shaft permanently, as the strain in a comparatively short period of time disappears, presumably by readjustment of the molecules, to accommodate the new shape of the shaft. It takes, to my mind, as much pressure to straighten a shaft as it does to bend it, so that this bears out the above statement, within the limits of one or two bendings, of course.

If the bend is so severe as to cause cracks to show in the shaft, the strength of the shaft is obviously permanently impaired, and it would be useless to straighten it, but the bends actually met with are very seldom in this class. Unfortunately, we do not at present know much about the behavior of steel under stresses between the elastic limit and the breaking stress, but the fact that steel can be stressed beyond its elastic limit a few times and recover its original strength, without any treatment, is shown in actual practice. For instance, the shell plates of every boiler that ever was built are strained past their elastic limit, in rolling to shape when cold, and evidently suffer no harm from it.

Another case is that of cold twisted bars used for reinforcing concrete. This cold twisting involves stressing the bars beyond the elastic limit, and yet tests show that the twisted bar has an elastic limit at least 60 per cent. higher than the original bar, and a tensile strength about 20 per cent. higher. That cold rolled shafting is stronger than the plain shafting is well known, and other like products could be cited which prove that a material stressed only once or twice, to a point between the elastic limit and the breaking point, is no weaker than it originally was, if not indeed stronger.

In Kent's Pocket Book are cited some tests proving the truth of this, and from page 239 of the first edition I copy the following: "The common opinion that straining a metal beyond its elastic limit injures it appears to be untrue. It is not the mere straining of a metal beyond one elastic limit that injures it, but the straining, many times repeated, beyond its two elastic limits."

Finally, then, my opinion is that Mr. Quist handled the job the best way, because he got a true shaft of the original dimensions, and that the internal strains from the bending are not of any importance, if indeed they exist at all.

EMERGENCY HINTS.

By A. L. MARSHALL.

While it is granted that the modern lathe is equipped with all thread cutting facilities, how about the poor old repair man, who must struggle along, in many cases, with very out-of-date equipment?

For example—suppose you had a few screws to cut 3-16″ diameter, 30 threads per inch, but your index showed only 28 and 32, but no 30. What would you do? Suppose the lathe you are using has a feed screw 5 pitch. Set the lathe for cutting six threads per inch and use the feed 5×6, this equalling 30. Of course, you cannot pick up the thread, but will have to run the lathe backwards before starting another cut.

Here is another dodge. Suppose a lathe will cut up to 14 threads per inch, but you suddenly need 16 threads per inch, on say a part ½″ long. You are in a hurry, so looking on your index you discover 3¼ per inch. 3¼ × 5 = 16¼ and half of this equals 8⅛. Now, the ⅛ ÷ 1-16″ = 1-128″, the amount of error, so if the job is not too important, go ahead. In any case, it's a good dodge if you're stuck.

MAKES TRAIN-STARTING EASIER

By the use of the new electro-pneumatic brake which is just being inaugurated on some of the trains of the Pennsylvania Railroad, the starting and stopping of trains will be accomplished with more ease than heretofore. Especially with long trains it has been impossible to start a train without some shock to the passengers, but the object of the new system is to secure a rapid simultaneous application and a graduated or direct release of the brakes on all cars, regardless of the length of the train, thus avoiding the objectionable slack action between cars. A turbo-generator situated at the top of the locomotive smokebox generates direct current at a pressure of 110 volts for actuating the electric magnets on the air brake valve of each car. When the engineer switches on the current and applies the air brakes, he is enabled to make a quick, smooth and safe stop, and the objectionable slack action between the cars is thereby avoided.

Cylindrical Tank Data

FIGURING CONTENTS WHEN PARTLY FILLED

The sketch and formulae show the method used in finding the quantity of liquid in a partly filled tank when it is resting in a horizontal position.

Example:—An oil tank six feet in diameter and ten feet long is filled to a depth of 4 1/2 feet; how many gallons are in the tank?

The area of the tank end equals:—

$.7854\ D^2 = .7854 \times 6^2 = 28.274$ sq. ft.

To find the area of the end of the contents it is first necessary to find the area of the segment e g c h. From the formula we find that half the chord (c g) equals the square root of the product of the height of the segment and the remaining portion of the diameter.

Half the chord (c g) $= \sqrt{1.5 \times 4.5} = 2.6$

Sine of the angle c o g $= 2.6 \div 3 = .8666$

Corresponding angle equals 60 degrees.

Area of the sector e g o h $= \dfrac{28.274 \times 120}{360} = 9.4246$ sq. ft.

Area of triangle g o h c $= 2.6 \times 1.5 = 3.9$ sq. ft.

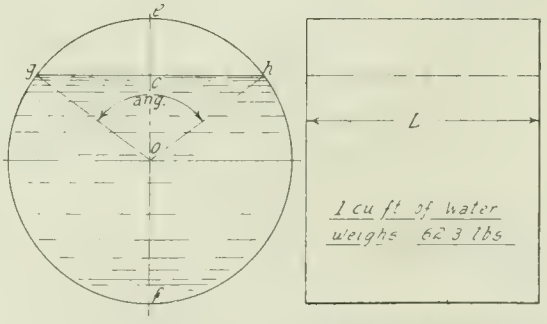
Area of segment e g c h $= 9.4246 - 3.9 = 5.5246$ sq. ft.

Area (a) of the end of contents $= 28.274 - 5.5246 = 22.7494$ sq. ft.

Volume of oil $= 22.7494 \times 10 = 227.494$ cu. ft.

Capacity $= 7.48 \times 227.494 = 1701\ 1/2$ U. S. S. gallons.

Weight of contents (specific gravity of 1.2) equals $62.3 \times 227.494 \times 1.2 = 17{,}007$ lbs., or about 8 1/2 tons.



A = area of end $.7854D^2$ a = area end of contents

ec = cg = cf cg = $\sqrt{ec \times cf}$

Sine of Ang. cog = cg ÷ og

Area of sector egoh A = ang. goh ÷ 360

Area of triangle gohc $\frac{gh \times co}{2}$

a = A − area of segment egch.

Vol of Tank A × L Vol of contents = a × L

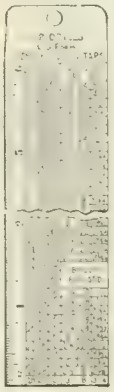
Capacity in U.S.S. gal Vol in Cu. ft × 7.48

" " Br Imp " = " " " × 6.23

Canadian Machinery

Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Only one contestant had a correct list this week, F. M. Conant, of the Canadian Link-Belt Co., being the gentleman in question. The scale goes forward to him at once. Who will be the next?

CONTEST FOR APRIL 21ST ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

1 Something free and well worth having.

2 A product that gives protection against electric shocks or heated parts.

3—Something that helps to keep products on the move.

4 How to find out about raw hide pinions.

5 -A method of eliminating a certain kind of cost.

6 How to get everything you require for a certain kind of shop.

7 -Something said to be almost 100% efficient.

8 A product said to cut faster and last longer.

9 -Something said to be a vital necessity to present day production.

10—A product that has been produced for the past forty years.

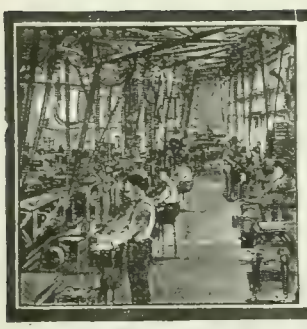
11—An important announcement.

12 A product said to be especially adapted to drop forging plants.

These are Correct Answers for List from March 31st Issue:

1—Elk Fire Brick Co. of Canada, Ltd.
2—R. S. Holly
3—Landis Tool Co.
4—Carlyle Johnson Machine Co.
5—Hendey Machine Co.
6—Canadian Ingersoll-Rand Co.
7—The Bristol Co.
8—J. H. Williams & Co., Ltd.
9—Brown & Sharpe Mfg. Co.
10—Smooth-On Mfg. Co.
11—Wright Mfg. Co.
12—Gisholt Machine Co.

Closing Date for This Contest is May 12th



DEVELOPMENTS IN SHOP EQUIPMENT

WICKMAN GAUGES

The Alfred Herbert Ltd., Coventry, England, with offices at 1-3 Jarvis St., Toronto, has placed on the market a line of adjustable plain and thread snap gauge known as the Wickman type.

This gauge has been developed from the plain adjustable type of snap gauge, and the frame is of high quality chilled cast iron of such a section as to reduce elasticity to a minimum. If the frame is thrown to the floor with sufficient force it will fracture. This is a safety factor. As stated by this concern, a gauge having a drop forging frame would still be intact—but on the other hand considerable error would no doubt have set in because of the heavy fall, with the result that valuable work would be spoiled.

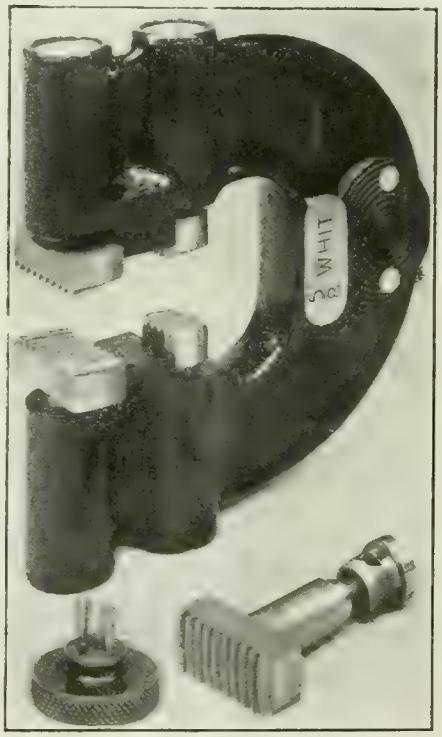
The first set of anvils are threaded in a precision lathe to true form, and after hardening are tested for pitch, and projected for accuracy of form. The various elements are also measured by means of od. V's and needles, in the same manner as a screw plug gauge.

The second set of anvils is shorter in lengths than the first set, consisting of only two or three threads which are cleared completely at the root and topped off at the crest. They merely test the effective diameter of the screw. They are calibrated by means of standard N.P.L. needles and the distance from the topped off portion to the true effective diameter is etched as a constant on the back of the anvil.

Assuming the first set of anvils set up to a hardened and ground plug (the size of which is the true core diameter of the thread to be gauged), or to slip gauges wrung up to the core diameter, the anvils will present a section of a perfect ring gauge. On the work being passed through them it will be obvious that no element of the thread on the work is larger than nominal.

Assuming that .006 inch is the predetermined limit which can be allowed as a decrease of effective diameter or thinning of this thread in order to produce satisfactory fits and long working life, the second set of anvils is set this amount below nominal by means of another plug gauge, or by means of slip gauges wrung to size. The second set of anvils will now represent the true section of a "no-go" effective ring gauge .006 inch below size, and if the work does not pass through these anvils it is obvious that the effective diameter is not below this predetermined amount and, therefore, the screw will not only assemble into the component, but will also assemble to a predetermined fit, and have a known length of useful life. If the screw will not pass the first anvils, on holding the gauge up to the light, with the screw between them, the operator can easily see what element is interfering and knows what to correct. Each of the anvils has an adjustment up to ⅛ inch, making a total adjustment of ¼ inch.

The references are merely hardened and ground steel cylindrical or slip



GENERAL VIEW OF THE GAUGE

gauges, and these thread snap gauges can therefore be inspected periodically at a minimum cosst. In this way, there need never be an inaccuracy in the set-up gauge of more than .0003 inch. The mechanism of the gauge is so arranged that it is impossible for the anvils to get out of "square" and also the gauge is absolutely tamper-proof.

The adjusting screw is covered by the locking screw, which in its turn is covered by a lead seal, closed into the recess at the top of the gauge by means of a special press. This press indents the firm's trade-mark in the seal thus preventing any unauthorized tampering or alteration.

The adjustment of the gauge is very simple and is such as permits of extreme accuracy. The stem of the anvil, which is hardened and lapped to fit the hole, is coned out on the top end to an angle of 60 degrees, in which rests a hardened steel ball. The adjusting screw, which is also hardened, has a similar cone underneath it and presses down on the same steel ball. The locking screw, the head of which bears in a counter-bore on the top of the gauge, passes through the hardened adjusting screw, through the clearance hole in the steel ball and into a tapped hole at the bottom of the countersink of the stem of the anvil.

Two holes are provided in the head of the locking screw and a special peg spanner (with prongs which go through these holes in the slots of the adjusting screw) is used for setting the gauge. To set the gauge, screw out the locking screw with a screw driver a number of turns, drop the peg spanner in position and rotate. The pegs will drop into the slots of the adjusting screw and rotate it; the cone of the adjusting screw will push down the hardened steel ball which in its turn will force down the stem of the anvil.

By giving the locking screw an extra twist with a screw-driver, it is possible to get any desired feed between the anvil and the setting gauge. The hardened steel ball is elastically compressible to a few ten-thousandths of an inch. For example, it is possible with this adjustment to pick up a set of slip gauges between the anvils; give the locking screw an extra slight turn, and the gauge will not pick up the slips. Release slightly, and the anvils will grip the gauges once more. This system of adjustment is the finest possible and when once locked it is impossible for any backlash to be existent. When the gauge is finally sealed, tampering becomes an impossibility and an attempt to set the gauge in a vise would result in the fracture of the frame.

To sum up briefly, the claims are as follows: 1. Length of life of the adjustable thread snap gauge is many times that of the ring gauge. 2. Complete visibility of any existing errors in thread to be gauged. 3. Absolute limit on the minimum effective diameter. 4. Easily inspected. 5. Easily adjusted. 6. Absolutely tamper proof when adjusted. 7. Tests "out-of-roundness" or concentricity. 8. Combined "go" and "no-go" gauge. Only one adjustable thread snap gauge is required, which is cheaper than

the two ring gauges often employed, and 9. Maintenance charges are negligible.

In another portion of this issue is given a further discussion on gauging, which space in this department did not permit.

QUICK ACTING DROP HAMMERS

The Massillon Foundry & Machine Co., Massillon, Ohio, have placed on the market a line of small size, quick acting drop hammers for use on light work. These hammers are built in sizes of 400, 600 and 800 pounds capacity, but other sizes can be built to meet special requirements, and the hammers can be operated by compressed air in place of steam, if so desired. The housings and base are steel castings and the cylinder is a semi-steel casting. The company has incorporated in these small hammers its design of adjustment for the ram guide that was originally brought out on hammers of larger size, to permit of the ready removal of damaged push-bolts. The guide adjusting screws are threaded through nuts set in open pockets in the side housings.

PRODUCTION TOOL HOLDERS

The Canadian Production Tool Co., Ltd., Walkerville, Ont., have placed on the market a line of tool holders that are a radical departure from the usual type. These holders are made of steel and are of very rugged construction. They are so designed that they can even use broken or worn drills as turning tools. This, of course, applies to the type of holder using round stock. In one particular case that has been brought to our attention, a worn drill was used as a turning tool on a nickel vanadium steel piston rod with splendid success.

These holders are made for round steel, square steel and regular cutting off steel section. In some cases double blades of cutting off shape are used, these performing operations such as cutting packing rings, spacing collars, etc. Then there is the wheel lathe tool holder which is designed to eliminate forging time of heavy steel, small bits fitting this holder in place of the heavy stock. In other cases special holders are made these including draw shaper tool holders of special construction to suit conditions.

In all the holders the chief idea is rigidity and saving in tool steel cost, as tool bits can be used in place of the regular large piece of steel, and the smal scrap of high-speed steel usually found in any machine shop can be utilized. The straight round turning type of tool holder is shown in the illustration, and from this readers can gather the general construction of these holders.

ADJUSTABLE BORING BAR

A special boring bar designed for the boring of holes from 1½ to 9 inches in diameter has been placed on the market by the Murchey Machine & Tool Co., of Detroit, Mich. The construction permits of accurate adjustment of the cutters to within 0.001 inch of hole diameter. Cutters can be rigidly secured after setting. Shanks of any desired size or shape may be furnished.

SLIP-COLLET DRILL CHUCK

The Dompier Chuck Co. of Detroit, Mich., are now manufacturing a quick-action drill chuck of the slip-collet type, specially designed for the triplex operation of drilling, boring and reaming. The collet may be inserted in the holder by the use of one hand only and may be removed from the holder by simply raising a knurled collar on the outside of the chuck. Wearing parts are made of chrome-nickel steel, hardened. The chuck is made in four sizes and holes are tapers to receive Morse shanks.

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GENERAL VIEW OF THE TOOLHOLDER. THESE ARE MADE OF STEEL THROUGHOUT

CANADIAN MACHINERY
AND MANUFACTURING NEWS

Published in the Interests of the Machinery, Manufacturing, Iron, Steel, and Metal Working Industries.

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The International Harvester Case

ONE of the most important moves made in the history of industrial relationships was that enacted at the Hamilton plant of the International Harvester, Ltd. A reduction in wages and piece-work rates was found to be necessary, owing to the changed prices at which they were selling the finished article and also owing to the dropping off in sales.

The Works Council of the plant dealt with the matter and five of the representatives of the men spent five days investigating the records of the company upon which the reduction in wages had been based in the first place. They were given every opportunity to go through production figures, cost records, orders booked, etc., in order that if possible they might bring out any other solution except a reduction in the wages of the workers.

At the end of this time they brought in their finding in which they state frankly that the company is justified in making the reduction in piece-work rates and wages, which they regretfully recommend should be accepted by the men in the plant.

It is a simple matter to share profits when times are good, but it is an entirely different affair to ask men to come and share the lean days of the company.

It must be that the Harvester people have won the confidence of the men to an unusual degree. Workers in a shop are not unreasonable when a firm will take the trouble to put all the cards on the table before the reasoning starts.

It is surely a great deal better for all concerned that representatives of the men should have gone over the records of the company's business, have an opportunity to see what the firm was doing, get in touch with the problems the executives have to face, than that they should be confronted with a typewritten notice pasted on the time clock, making the curt announcement that wages had been reduced.

One may argue that it is an easy way out for the company? Is it?

As the market stands at present, the easy way out would have been for the International to shut up shop for a period in order to get rid of the stock of implements it has piled up. The action of the men in accepting a reduction puts it up to the company, in a new way, to keep on running.

The development is interesting because it is human and wholesome. It shows that there is a place for Works Councils and kindred organizations and demonstrates that if frank honesty is established between office and shop, it is quite possible for each party to drop the gas pipe that has too long been carried up the sleeve of industrial leaders on both sides of the question.

The New Steel Prices

THE coming of the new schedule of the U.S. Steel Corporation was not unexpected. It had been common talk for weeks and it remained only for Judge Gary to fill in the blanks that the guessers in the market had spread out before him.

In a general way the trade in Canada is pleased with the new schedule. It comes down enough to be a reasonable price and it does not come so far as to cut the ground from under the feet of those who have fairly large stocks either in warehouses or factories.

Warehouses can go ahead on their present selling prices. The new U.S. prices become the basis for operations here, but warehouse selling has been largely for liquidation for some time past.

No doubt an effort will be made to establish new market standards for this district when present stocks are lowered. Just now price-cutting is being indulged in. There may be more fancy names for the practice, but that is the actual condition.

Bar iron, for instance, is selling at so many prices that it would keep a sharp young man busy placing them on record. We hear of sales all the way from 3.50 to 4.25. The new price at Pittsburgh—and on this price Canadian mills must base their sale price—is 2.10 cents per pound. At present rates of freight and exchange, it means 3.16 put down in Toronto. If dealers are going to make a reasonable profit the new market will have to be built around four cents.

It can hardly be urged that the new prices will bring about a buying movement, although certain tonnages that have been held up awaiting the new price have been released.

The two-headed steel market has more or less disappeared and there is reason to believe that present prices will hold for a reasonable time.

Taking an average ton, that is, pooling the prices of Bessemer steel rails, plate, wire nails, steel beams, steel bars, tin plate, Bessemer iron and steel billets, we find the new schedule is $58.54 per ton, against $63.49 before. In 1920 it was $78.21; in 1919, $65.92; in 1918, $70.52; in 1917, $91.01, and in 1914, the year the war started, $30.97.

The market now has the advantage of a price on basic materials that it can accept with confidence. Heretofore no selling schedule could be absolutely relied upon and it brought with it a condition where buying was of necessity reduced to a minimum.

"Iron Trade Review"—Examination of market trends over the past few years shows that practically all major movements in steel and pig iron have been preceded by a movement in scrap prices. The response of other prices has varied from two weeks to two months after scrap but in each case has followed unerringly.

Russia Must Reform

CANADIAN firms are making little effort to secure trade with Russia. They have no guarantee of stability and some of them have vivid recollections of large losses following the overthrow of business order and honorable business methods there.

The U.S. Secretary of State, while expressing the sympathy of his people for the people of Russia, can see no chance for business with Russia until Russia becomes a different Russia. Production is the big chance for Russia and it is also the big chance that the present leaders of industrial and national damnation in that country wish to avoid.

The Secretary of State, on this point, says: "Production is conditioned upon the safety of life, the recognition by firm guarantees of private property, the sanctity of contract, and the rights of free labor. If fundamental changes are contemplated, involving due regard for the protection of persons and property and the establishment of conditions essential to the maintenance of commerce, this Government will be glad to have convincing evidence of the consummation of such changes, and until this evidence is supplied this Government is unable to perceive that there is any proper basis for considering trade relations."

Canadian business, we believe, will readily subscribe to that statement. There are enough industrial quicksands in our own country without reaching out to stick a leg in the Russian mess.

Some worthy chap rose up this week and said: "In every business concern, large or small, there is, on the part of every individual, a natural eagerness and desire to get ahead, and more or less rivalry ensues as a result. It is a great mistake, however, to have uppermost in mind the idea of 'beating the other fellow to it,' some particular friend, associate or neighbor. Such rivalry breeds animosity and trouble. The surer way is to get ahead of yourself each day—never mind the other fellow."

"American Machinist"—In one recent case of this kind a contract was taken at what seemed a very low figure and the high bidder protested that it could not be made for the price asked. So the successful bidder showed his shop time on the job to be 48 hours, as against the other bidder's estimate of 155 hours. A comparison showed modern equipment in one plant—out-of-date machinery in the other.

ANY OF THESE EXERCISES NEEDED AROUND YOUR PLANT?

NOW, this chap whom the cartoonist has put on the flat of his back is not having a good time.

But he is having a time that is going to be good for him.

Does this man look like your business, your prices or any part of your organization?

Perhaps he may resemble some of the left-over, war-time ideas and customs.

He may represent some of your selling methods. If so, you better pull all these fat boys out and put them on the mat.

There may be some hurt feelings—there may be a few squeaks.

The truth is you have got to get on the carpet and shake out the useless material, no matter whether it's in your own system or out in the mechanical department.

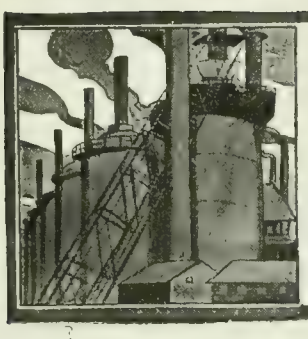
Perhaps your surplus fat consists of a lot of old rattle-trap equipment that you know right well will have to be booted when operations get geared up to anything like capacity.

Those old machines have been wheezing away for years. When you are showing your friends through the plant you try and tell a good story that will raise a laugh when you are passing them. You really don't like to pull up in front of them and say: "This is my plant."

No matter where your surplus weight hangs, better get it out on the floor and start the reducing exercises.

Harding in Brooklyn "Eagle."

There's always some hardship about these reducing exercises.



MARKET DEVELOPMENTS

New Steel List is Well Received by the Market

Cuts Made Give Dealers and Others Holding Stocks in This Country a Chance to Get Rid of Material—Number of Prospects in the Market But Actual Business Signed is Not Large

THE Canadian steel trade seems to give a very favorable reception to the new schedule announced in the United States Steel Corporation. Dealers in steel are glad that the cuts went as far as they did and they are also pleased that they stopped where they did. Many manufacturers, for the present at least, take the same attitude, as a deeper cut would take too much ground out from under their feet and embarrass them for future operations. As the schedule stands at present the market agrees that it should form a basis for operations for the next three months and after that deviations from it, if there are any, will be small. No one claims that it is going to start a buying movement, for if that were possible by announcing a new price list, it can be taken for granted that the Corporation would have put out the new list weeks ago. The market is undoubtedly stronger to-day than before the list appeared and the bringing about of that condition was essential to better business in the future.

The machine tool trade has had a quiet week and the selling of used equipment experiences the same condition. There are a number of very good inquiries in the market, but the absence of pressing need for equipment makes it possible for the should-be buyers to keep putting off the actual purchasing of equipment.

Small tools are being taken for actual needs only and considering the low rate at which many of the shops in this district are operating, this means a slow business for the dealers.

The scrap metal market shows no more strength than it has for a good many months past. Figures quoted are purely nominal and dealers will pay them only when they have to.

Pig iron is now selling for $34.10, and car lots are about the limit of buying. One furnace is prepared to keep going until it has piled 20,000 tons.

MONTREAL DOES NOT EXPECT ANY CHANGE BECAUSE OF NEW SCHEDULE

Special to CANADIAN MACHINERY.

MONTREAL, April 21.—Local industry seems more or less inactive at present although business is showing slight improvement in some quarters. The unemployment problem is less acute, owing to the large number of men recently started by the Tramways Company in the laying of new roadbeds throughout the city streets. The harbor is gradually assuming its normal spring activity, although it will be some weeks yet before operations are at the maximum. Reports from many merchants reflect the gradual lifting of the depression that has hung over the business world for many months, but the trend toward improvement is so gradual that it is noted only by the observing optimist.

Local Market Not Affected

Despite the fact that the trade has been looking forward to an announcement by the United States Steel Corporation, regarding a downward revision of prices, the reductions made last week have not yet been felt in this district. As one dealer put it: "There is practically no business going through and the matter of price has little influence on the market. We are told that some mills in the States are quoting as low as $2 on plates but even at this figure there is very little booking being done. A general revival of business must take place before buying of steel will be resumed." The interest of the trade just now seems to be centered in the coming developments in railroad circles, as it is felt that any resumption of activity is dependent on an early and satisfactory settlement of the railroad problem, both as regards to wages and freight rates. A steel merchant here, who has reported a weekly improvement for the past several weeks, again states that sales continue to increase and that they expect this month's business will surpass any previous month's since last fall. "However," said the dealer, "it will require to improve considerably more before we are back to normal."

Business Slowly Improving

While nothing of an outstanding character has developed in local machine tool circles, business is considered fairly good in face of the quiet industrial conditions now prevailing. "Sales are not large," remarked one dealer, "but we continue to dispose of machinery and equipment in sufficient volume to make the month's aggregate compare favorably with that of previous months." This is the substance of the remarks generally made by the average dealer and one has often to make his own calculations as to the extent of "good business." One thing is certain, and that is, that dealers and jobbing houses are getting rid of much of the stock carried over from last year before replenishing their floors or shelves with new materials. There is a gradual lowering of quotations on standard equipment. "Since the first of the year," said the dealer, "it is safe to say that a reduction of about 15 per cent. has been made on the selling prices of nearly all the principal lines." A period of anticipation seems to be passing just at present, as indicated in the remark of a dealer here this week. He said: "We are now passing through a period where any idea of profits must almost be forgotten. How long this will last, no one can tell, but we feel that we are on the verge of that long looked for 'readjustment' that will eventually lead us into the paths of a real industrial revival."

There appears to be a goodly demand for the lighter factory supplies, but heavy machinery is moving slowly. Fairly good sales of wire rope are reported.

Metals Are Not Affected

"The movement of metals is dependent on industrial activity and until general business shows improvement we cannot expect to see a heavy demand for ingot metals. We are disposing of quite a quantity of ingot and sheet metals but usually in small lots, the practice apparently being for consumers to purchase only what they require for immediate use." This statement regarding the metal situation might well apply to many other lines, as the policy on every hand seems to be one of careful conservatism.

NEW PRICE LIST IS APPROVED HERE

Schedule of U.S. Steel Corporation Will Not Make Much Difference in the Markets

TORONTO.—The machine tool market, the steel market, can be described as "spotty." One dealer claims that business has been very poor with him for some weeks past, while the very next place will show records of shipments and orders that have made a very good showing in the same period. So a person really has to make a good many calls now in order to collect enough information to get a fairly accurate view of the real situation.

Machine tools are not moving fast. The general manager of one large firm in Toronto, discussing the situation this week, said: "Buying for the present seems to have been pretty well tied up. It is hard to see that it is a matter of price, although there are some statements put out that the reductions made by many of the makers are not final, and that better figures will be coming shortly. I can't see where this comes in at all. Judging from our own records it would not be correct to say that many sales are being held up by the price now. The used machinery market is also dull, although the wood-working end of it is showing up better than the selling of metal-working equipment."

Another dealer was quite certain that in the next two or three months he would close quite a few orders that were not yet advanced beyond the consideration stage. A number of firms had fully decided on what equipment they wished to put in, but the actual placing of the business was being held up for the present. It is a tiresome piece of business, waiting for orders that have been practically closed, but the business is good and will come into the market eventually.

The sale of small tools, reamers, cutters, taps, dies, drills, etc., is still being carried on in a very small way. The orders coming in call for such supplies as may be actually needed, but nothing more, so with the present low rate of operation in many of the plants the business coming to take care of day-to-day breakage is very small.

In the Steel Market

The new schedule of the United States Steel Corporation has formed the topic of conversation in the steel market this week, and general satisfaction seems to be expressed at the extent of the reductions made. Most of the local warehouses have been engaged for the past three or four months in getting rid of stocks of high-cost bars, of which some of them had quite a tonnage.

Some of the independents have done as low as two cents on these and reports had it that the Corporation would go as far down as 1.75. Instead, the new price is 2.10 against 2.35, the former figure. At present rates of exchange this will mean about 3.16 laid down in Toronto, making the warehouse price around 4c, which can be regarded as fairly close to the present market. Of course, there will be profit for merchants at 4c, when they get shipments at the new price, whereas there is no money in it for them selling out high cost bars at 4c.

Structural and plate are again at a flat rate of 2.20 against 2.45 for the former and 2.65 for plate. Coming back to the same price is reverting to prewar practice. During the war the call was for plate, and it got a premium price owing to the demand.

The Effect on the Market

A. T. Enlow, president of the Dominion Sheet Metal Corporation of Hamilton, a large buyer of sheets, believes the new prices will tend to stabilize the market. He holds that the independents and the Corporation will agree on prices. J. G. Near, general manager of Peckovers, Ltd., Toronto, was satisfied that the announcement would give some confidence in the market for the next three or six months at any rate.

Mr. David, of Baines & David, believed that the most that could be hoped for at the present time would be an added stability to the market. "We can't be busy and well employed here with the other part of the world not yet recovered from war," is his view. "Under the circumstances," added Mr. David, "the new price list has been very carefully compiled."

The general feeling in the market was that the time was ripe for the Corporation to come out and make its schedule known. The trade had lost confidence in any and all so-called price schedules. Even the United States Steel Corporation price was being allowed to sag in order to hold business. The attempt by independents, earlier in the week, to bolster up the market by withdrawing low figures on sheets could not succeed. There had been so many prices peddled in Canada that the buyers were dizzy, and when the trade arrives at the stage where no one believes that he is getting the best price, then buying is going to be on an ounce-for-ounce basis, covering absolute requirements and no more.

The Real Effect

No one is going to put forth the claim that the new schedule will mark the beginning of a buying movement. The Corporation itself could not expect that, otherwise they would have trimmed prices weeks ago. The real benefit is here — that a standard has now been fixed around which the markets and business of the future can be conducted and planned. With that accomplished, a big step has been taken toward bringing about a healthy feeling in the trade, where speculation and guessing have too long had preference over that necessary degree of confidence and certainty, without which the steel markets in general have simply been wandering around in circles.

Varying Reports

Trade comes to different warehouses in different volumes. Some of the yards have not done the business they anticipated in boiler tubes, for instance. This is the season when the boiler tube business should still be good. Some of the dealers, on the other hand, claim that

POINTS IN WEEK'S MARKETING NOTES

Armstrong, Whitworth of Canada state that lack of protection has made it necessary to close their steel tire plant at Longueuil.

Many dealers are selling at present with the idea of getting stocks as low as possible, regardless of what they miss in the way of profits.

Dominion Steel Products at Brantford are taking over the Darling Valve & Manufacturing Co., of Williamsport, Pa.

The machine tool market is quiet, although some interesting inquiries continue to come into the market.

Canadian trade seems to be well satisfied with the new schedule announced by the U. S. Steel Corporation.

Pig iron is now offered by Canadian makers at $34.10, following the acceptance of the $25 level at U. S. points.

Scrap metal market is dull, with prices nominal and trading in small quantities.

tubes have been among their best business this year. Shafting has also been in demand. There were many months in recent years when it was almost impossible to get shafting, and as a result there was an accumulated demand to look after.

Dealers, when asked what effect the new price would have on bars in the warehouse, stated that there was a general feeling that the price of bars in Toronto warehouses should find a level around four cents per pound. There have been some sales going quite a bit below this figure, and one case was heard of where a sale had gone as low as 3.50. This was on a tonnage that the dealer was anxious to unload, and cannot be regarded as indicating a real market level. Warehouses have been clearing out stocks, and in some cases have been applying mill prices on warehouse stocks.

The Price of Pig Iron

Following the forcing of the pig iron market in the States down to $25, Canadian makers have placed their price at $34.14. Orders are small, one dealer regarding an order for a car of 50 tons as a pretty good piece of business this week. Canadian makers can hardly stand to make a very big profit at this new price. Some of them have great piles of coal which was brought in at a time when prices were high, and the same can be said of their ore. The price of pig has been steadily reduced. Some of the stacks are piling pig iron in their yards, one company expressing a willingness to do this to the extent of 20,000 tons, before blowing out.

NEW PRICE OF THE STEEL CORPORATION PUTS END TO THE DOUBLE STEEL MARKET

Special to CANADIAN MACHINERY.

PITTSBURGH, April 21.—The slight advances in steel prices begun by independents, as noted last week, became general among the independents not merely in bars, shapes and plates, which were covered by the first advances made, but also in sheets and wire products. Then the United States Steel Corporation began making reductions, the result being that the Corporation and the independents are again on the same basis. The common expression is that the market is "equalized." Roughly speaking, the advances of the independents represented on an average about one-third, and the reductions of the Corporation about two-thirds of the total gap that had separated the two sets of prices.

Neither the independents nor the Steel Corporation made any formal statements as to the cause or causes of their action. One might assume that the Steel Corporation reduced its prices upon finding that it would not take as much reduction as it formerly would have to equalize the market, or one may assume that the independents made their advances from having information that the Corporation had decided to reduce its prices, and as the Corporation would of course reduce its prices to the lowest levels made by independents it would be good policy on the part of the independents to put their prices up so that the Corporation would not have so far to go.

Practically the whole trade is convinced that the latter is what occurred. The independent advance was too sudden to be a mere matter of chance. It looked decidedly as if the independents had word that the Corporation had set a time when it would reduce its prices and hastened to give the Corporation a higher basis on which to work. That the Corporation did plan the matter a trifle in advance is known from the fact that the advances started with a meeting in New York of the subsidiary company presidents, some of whom had to travel long distances to get to the meeting and had to be notified in advance.

Price Changes

The price changes in most of the commodities can be shown in a table, as given below. The Industrial Board prices of March 21, 1919, were those of the Steel Corporation until its present reduction. The second column gives the independent prices prior to the adjustment, while the third column gives the prices to which the independents advanced and the Steel Corporation reduced:

	Industrial Board	Independent	Present
Bars	2.35	1.90–2.00	2.10
Shapes	2.45	2.00–2.10	2.20
Plates	2.65	1.90–2.10	2.20
Black sheets	4.35	3.75	4.00
Blue annealed sheets	3.55	2.80–3.00	3.10

The case of galvanized sheets was different. The Industrial Board price was 5.70c, independents having gone to 4.70c and 4.80c, according to size of order, while they advanced to 5.10c, but the Corporation did not recognize this price, naming instead 5c.

In plain wire there was another difference. The Industrial Board price was 3c, but wire was one of the three or four commodities on which the Corporation made advances in August, 1920, advancing the price to 3.25c. The independents had been quoting 3c and sometimes less, and the Corporation came down to 3c. Nails showed another divergence. They were $3.25 on the Industrial Board schedule, while the independents after going up to $4.25 and higher in 1920 got down to $3 a few weeks ago, and then advanced to $3.25, while the Corporation has reaffirmed that price. Thus nails are the only product remaining on the Industrial Board schedule.

In the products mentioned above the cutting began about February 1. In tubular goods cutting did not appear to any extent until March, and just before the Steel Corporation began making reductions the Steel & Tube Company of America, as noted in last report, made a further cut, making the total about $10 a ton below the Industrial Board or Steel Corporation prices. The independents made no effort to go up from their extreme cut prices, but the Steel Corporation instead of reducing by the same flat amount has made various reductions, which in general may be described as involving five points (a point being approximately $2 a net ton) on sizes 6-inch and under, and four points on sizes 7-inch and over, this applying to standard steel pipe, line pipe and in general to oil country goods. The smaller sizes of standard pipe were reduced less, and ⅛-inch was not reduced at all. Doubtless the independents will now advance on the smaller sizes.

Hoops and bands are reduced by the Steel Corporation from 3.05c to 2.75c. Hot rolled strips are formally quoted by the West Leechburg Steel Company at 2.75c and cold rolled strip at 5.50c.

Effect of Equalization

The Steel Corporation, as a result of its price adjustment, will doubtless have heavier specifications and more releases against suspended orders, from its regular customers, and its operating rate may increase somewhat from the 40 per cent. or thereabouts to which it has declined, from over 90 per cent. at the beginning of the year. The independents cannot expect to book more business than they were booking in the past few weeks, but it seems they rounded up some business that was hanging fire, when they withdrew their lower quotations. The independents have been operating at about 35 per cent. lately, against 30 per cent. in both January and February. These percentages are higher than have been commonly estimated in the trade. For one reason or another the independent mill operations have been underestimated in trade talk for four months or more, while the figures here given are substantially correct.

Prospects

When the steel industry is operating at between 35 and 40 per cent. men are naturally disposed to ask "When is it going to operate at 100 per cent?" but that is not altogether a reasonable question, for it assumes offhand that whatever the steel making capacity, it is the function of buyers of steel to give it full employment. Responsibility for the present capacity rests with the war, not with the buyers of steel, the capacity being one-half greater than just before the war, and for several years before the war the capacity had not been fully engaged for more than about half the

time. It would require a collection of favorable conditions that could properly be called abnormal to engage fully a steel making industry that has what is plainly an abnormally large capacity, and the sooner everyone realizes this fact and takes cognizance of it in his calculations the better it will be. In the first nine months of 1920, when there appeared to be heavy demand, the industry operated at only 80 per cent., being restricted by various conditions.

The fair, and really rather hopeful, prediction is that by about next October the production of steel may be about one-half greater than it is now. That would mean a rate of ingot production of about 29,000,000 tons a year, or about the average rate in 1912 and 1913, by far the best tonnage years before the war, but it would be a rate of only 55 per cent. of capacity.

SINGLE MACHINES IN N. Y. MARKET

Business There Has Been Done on a Small Basis and Continues in that Way

Special to Canadian Machinery

NEW YORK, April 21.—The business readjustment proceeds slowly, but there are increasing evidences of a trend in the direction of improvement. The most constructive bit of news in the week was the announcement of the Railroad Labor Board of the abrogation of wage agreements with a part of railroad labor, which possibly will mean a saving of $300,000,000 a year to the transportation companies. On top of this, President Harding's cabinet on Friday considered steps to be taken toward a readjustment of railroad freight rates on a basis that will be conducive to a revival of business. Unquestionably much business is adversely affected by high freight rates. Secretary of Commerce Hoover stated in a public address this week that the freight rate on a bushel of wheat from the Argentine is 10 cents as compared with 30 cents from our own wheat-producing sections of the West to the Atlantic coast.

High money rates have been a deterrent factor in business, and some easing of this situation is noted in the announcement of the Boston Federal Reserve Bank of a reduction in the rediscount rate from 7 to 6 per cent. If other Federal Reserve Banks follow this action soon, there may be money available at 6 per cent. to permit construction work and other investment buying.

Meanwhile, the machine-tool trade is merely marking time. The promise of improvement within the near future which was indicated by the recent increased volume of inquiry has not been fulfilled, nor does the machine-tool trade expect much improvement until the whole business situation has cleared up.

There has been very little new inquiry for tools in the past week. Business is confined almost wholly to single machines, and the smaller manufacturers are more active in buying than the large ones.

Pig Iron Markets

In the Pittsburgh district the pig iron market is in much the same condition as during the past few weeks, orders being limited to small lots for prompt shipment. No new inquiries of any size have come out. Foundry iron is generally quoted at $25, valley furnace, for No. 2.

Boston reports a sale of 700 tons, comprising four brands of Buffalo and Pennsylvania irons, various silicons, to a southern New England melter, and another of 300 tons Pennsylvania iron to a Connecticut foundry. These lots are resale, prompt shipment iron, and terms private.

Practically no business was done during the week at St. Louis.

The pig iron market at Pittsburgh is flat. Generally, makers of foundry iron are not inclined to go below $25, valley furnace, and one merchant interest reports having turned down 500 tons of this grade carrying a price of less than $26.

On the Chicago market many foundries which have been out of the market for a protracted period are now buying carload lots for spot shipment. Melters are continuing to purchase their needs cautiously.

The market continues dull at New York and the only business of any considerable size which has been talked about has been in connection with the cast iron segments which will be needed for the vehicular tunnel under the Hudson River, between New York and New Jersey.

There is very little activity in the local market at Cincinnati. The principal inquiries are for 1,000 tons of northern foundry iron, and a cast-iron pipe company is reported willing to buy 500 tons, providing prices quoted are satisfactory.

Scrap Metal Market

Prices on Pittsburgh market are still downward because of the continued lack of consumptive buying, and the fact that dealers with yards do not feel they can safely lay down much material at current prices. The prices quoted in all cases represent what dealers are willing to pay for yard tonnages, and are not a good line on what the steel manufacturers or foundries would have to pay if they were in the market.

Purchases by consumers have practically ceased on the Chicago market except for hand-to-mouth buying of cast scrap. Although mill and blast furnaces have reduced the quotations on their products since the war, old material has declined relatively much further.

Scrap metals have further declined during the past week at New York and new post-war levels have been reached. A railroad which put out a list of about 6,000 tons withdrew it because of the low bids of dealers and brokers.

There has been a small movement of stove plate at $19 on the Buffalo market. Dealers report little activity.

Althought the scrap market at Boston is limited, the market is more active than it has been for several weeks.

COMPARE NEW AND OLD FIGURES

Reductions Recently Made In Selling Prices of Various Lines of Steel

Here are the new prices of the United States Steel Corporation, compared with the old:

	New Prices	Industrial Board Prices
4 x 4-in. and heavier billets, per gross ton	$37 00	$38 50
Slabs, per gross ton	38 00	11 00
Sheet bars and small billets, per gross ton	39 00	42 00
Bars, per 100 lbs.	2 10	2 35
Plates, per 100 lbs.	2 20	2 65
Structural shapes, per 100 lbs.	2 20	2 45
Wire rods, per gross ton	48 00	52 00
Plain wire, base	3 00	3 00
Wire nails, per keg, base	3 25	3 25
Tin plate, per base box	6 25	7 00
Blue annealed sheets	3 10	3 55
Box annealed, black	4 00	4 35
Galvanized sheets	5 00	5 70

BRANTFORD FIRM TAKES NEW LINE

Darling Valves Will be Made at Plant of the Dominion Steel Products in Short Time.

BRANTFORD. — Announcement was made of the taking over by the Dominion Steel Products Co. of the Darling Valve and Manufacturing Co. of Williamsport, Pa. This company makes a line of valves for waterworks, oil lines and other pipes and hydrants, and has a reputation very high in Canada as well as in the United States, where the parent plant is located. Owing to the high duty on their products, which in the United States sell for a higher price than the products of their competitors, the market in Canada was limited, yet despite this they were used considerably, Brantford and Ottawa being among the cities which utilized their goods.

It was reported at the D. S. P. that the company was already receiving business in the new lines. The signing of the contract means that No. 1 and No. 2 plants will be opened for the manufacture of these goods as soon as necessary changes can be made, particularly in the foundry. It will take three or four weeks to bring these changes into effect and to get the plant upon a full production basis.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$25 00
Lake Superior, charcoal, Chicago	40 50
Standard low phos., Philadelphia	41 50
Bessemer, Pittsburgh	28 96
Basic, Valley furnace	26 00
Toronto price:—	
Silicon, 2.25% to 2.75%	34 10

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Iron bars, base, Montreal	4 25
Steel bars, base, Montreal	4 25
Reinforcing bars, base	4 25
Steel hoops	5 50
Tire steel	5 00
Spring steel	8 00
Band steel, No. 10 gauge and 3-16 in. base	4 75
Chequered floor plate 3-16 and heavier	6 50
Bessemer rails, heavy, at mill	2 35
Steel bars, Pittsburgh	2 10
Tank plates, Pittsburgh	2 20
Structural shapes, Pittsburgh	2 20
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 48
Structural shapes	3 58
Plates	3 78
Small shapes under 3-in.	3 48

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points

	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

Current surcharge, 8 per cent.

METALS

Gross.

	Montreal	Toronto
Lake copper	$18 00	$17 50
Electric copper	17 50	17 50
Castings, copper	17 25	18 00
Tin	36 00	39 00
Spelter	7 75	7 50
Lead	6 50	7 50
Antimony	8 00	8 25
Aluminum	34 50	30 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$5 00	$4 75
Plates, ¼ up	4 50	4 25

PIPE—WROUGHT

Standard Buttweld Pipe S/C

Per 100 feet.

	Steel		Gen. Wrot Iron	
Size	Blk.	Galv.	Blk.	Galv.
⅛ in.	$ 6 50	$ 8 50	$	$ ....
¼ in.	4 89	6 99	5 91	8 01
⅜ in.	4 89	6 99	5 91	8 01
½ in.	6 50	8 03	7 95	9 48
¾ in.	7 89	10 06	9 97	12 02
1 in.	11 82	14 88	14 71	17 77
1¼ in.	15 99	20 13	19 90	24 04
1½ in.	19 11	24 06	23 79	28 74
2 in.	25 72	32 38	32 01	38 67
2½ in.	40 66	51 19	.....	.....
3 in.	53 17	66 94	.....	.....
3½ in.	67 62	84 18	.....	.....
4 in.	80 12	99 74	.....	.....

Standard Lapweld Pipe S/C

Per 100 feet.

	Steel		Gen. Wrot Iron	
Size	Blk.	Galv.	Blk.	Galv.
2 in.	$29 42	$36 08	$35 71	$42 37
2½ in.	44 17	54 70	54 11	64 64
3 in.	57 76	71 53	70 76	84 53
3½ in.	69 46	86 02	85 10	101 66
4 in.	82 30	101 92	100 83	120 45
4½ in.	95 89	1 20	1 30	1 54
5 in.	1 12	1 40	1 52	1 80
6 in.	1 45	1 81	1 97	2 33
7 in.	1 89	2 37	2 53	3 01
8L in.	1 99	2 49	2 66	3 16
8 in.	2 29	2 87	3 07	3 64
9 in.	2 74	3 43	3 67	4 36
10L in.	2 54	3 18	3 41	4 05
10 in.	3 28	4 10	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4-in. and under, 50 per cent.
4½-in. and larger, 40 per cent.
4-in. and under, running thread, 20%.
Standard couplings, 4-in. and under, 20%
Dd., 4½-in. and larger, net.

OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

	Montreal	Toronto
Copper, light	$ 6 00	$ 9 00
Copper, crucible	11 00	11 00
Copper, heavy	10 00	11 00
Copper wire	10 00	11 00
No. 1 machine composition	8 50	9 75
New brass cuttings	6 00	8 00
Red brass turnings	7 50	8 00
Yellow brass turnings	5 00	6 00
Light brass	3 50	5 00
Medium brass	4 00	6 00
Scrap zinc	4 00	4 00
Heavy lead	3 50	4 00
Tea lead	2 00	2 00
Aluminum	12 00	10 00

	Per Ton	Gross
Boiler plate	$10 00	$12 00
Heavy melting steel	9 00	14 00
Axles (wrought iron)	22 00	20 00
Rails (scrap)	12 00	14 00
Malleable scrap	12 00	20 00
No. 1 machine cast iron	28 00	25 00
Pipe, wrought	8 50	8 00
Car wheel	28 00	25 00
Steel axles	18 00	18 00
Mach. shop turnings	5 00	6 00
Stove plate	20 00	20 00
Cast boring	3 00	7 00

BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts, 7-16 and up	Net list
Carriage bolts, ⅜" and less	15
Coach and lag screws	—20
Stove bolts	55
Wrought washers	—25
Elevator bolts	Net
Machine bolts, 7-16 and over	—5
Machine bolts, ⅜-in. and less	—30
Blank bolts	Net
Bolt ends	—5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	Net
Machine screws, o. and fil. hd., brass	Net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 25
Nuts, hex., tapped	add 2 75
Copper rivets and burrs, list less	27½
Burrs only, list plus	10
Iron rivets and burrs	37½ and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	67½
Wood screws, flat, bright	67½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	Less 40%
Square and hexagon head cap screws	Less 30%
Round head cap screws	Plus 10%
Fillister head cap screws	Less 10%
Flat head cap screws	Net list
Button head cap screws	Plus 10%
Studs	Less 20%
Semi-finished nuts up to and including 1-in.	Less 35%
Semi-finished nuts 1⅛ to 1½"	Less 30%
Semi-finished nuts 1⅝ to 2 in.	Net list
Coupling bolts	Plus 10%
Taper pins	Less 40%
Planer bolts without fillet	Plus 40%
Planer bolts with fillet	Pus 50%
Patch bolts	Plus 80%
Hollow set screws	Plus 20%
Thumb screws	Less 35%
Thumb nuts	Less 65%

BILLETS

F.O.B. Pittsburgh.

	Per gross ton
Bessemer billets	$43 50
Open-hearth billets	43 50
O.H. sheet bars	39 00
Forging billets	48 50
Wire rods	48 00

NAILS AND SPIKES

Wire nails, base	$4 55
Cut nails, base	5 10
Miscellaneous wire nails	50%

ROPE AND PACKING

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 26
British Manila rope	0 20
New Zealand hemp	0 20

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	Net

MISCELLANEOUS

Solder, strictly	$ 0 25
Solder, guaranteed	0 27
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	17 00
Red dry lead, 100-lb. kegs, per cwt.	13 00
Linseed oil, boiled, single bbls.	1 03
Wood alcohol, per gal.	2 75
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire size	40 and 5
Can. carbon cutters, plus	10
Standard drills, all sizes	40 and 5
3-fluted drills, plus	10
Jobbers' and letter sizes	40 and 5
Bit stock	**50**
Ratchet drills	10
Pure turp., single bbls., gal.	1 20
Linseed oil, raw, single bbls.	1 00
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	Net
Bridge reamers, carbon	50
Centre reamers	5
Gasoline, per gal., bulk	0 42
Chucking reamers	Net
Hand reamers	10
High speed drills, list net to plus	20
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At Warehouse]

Rounds and squares	$7.00 base
Hexagons and flats	7.00 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	26	36
Class C	17	26

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 00	$ 6 50
Sheets, blue ann., No. 10	5 25	5 50
Canada plates, dull, 52 sheets	7 50	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz., galvanized	.....	.....
Queen's Head, 28 B.W.G.	10 75	.....
Fleur-de-Lis, 28 B.W.G.	10 00	.....
Gorbal's Best, No. 28	.....	.....
Colborne Crown, No. 28.	.....	.....
Premier, No. 28, U.S.	8 25	8 50
Premier, 10¾-oz.	8 25	8 90
Zinc sheets	13 00	15 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClennand, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES

Size	Seamless	Lapweld
1 in.	$26 00	$.....
1¼ in.	27 25	.....
1½ in.	26 25	29 50
1¾ in.	29 75	27 00
2 in.	29 25	24 50
2¼ in.	33 00	28 50
2½ in.	44 75	32 50
3 in.	49 25	40 00
3¼ in.	.....	48 50
3½ in.	63 50	43 50
4 in.	85 00	55 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS

Castor oil, per lb.	—
Royalite, per gal., bulk	28
Palacine	31
Machine oil, per gal.	58
Black oil, per gal.	27
Cylinder oil, Capital	1.01
Petroleum fuel oil, bbls., net	11.2

BELTING—No. 1 OAK TANNED

Extra heavy, single and double	15%
Standard	15 and 10%
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 50
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	8¾
Pumice, ground	06
Emery glue	30
Tripoli composition	9½
Crocus composition	12
Emery composition	11
Rouge, silver	64
Rouge, powder, nickel	38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	8½
Grits, 80 and finer	6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	30
Brass sheets, 24 gauge and heavier, base	38
Brass tubing, seamless	42
Copper tubing, seamless	44

XXX Extra	21	Atlas	19
Peerless	22	X Empire	15
Grand	21½	Ideal	18
Superior	21½	X Press	13½
X L C R	16½		

WASTE

Colored

Lion	13½	Popular	10½
Standard	12	Keen	9
No. 1	14		

Wool Packing

Arrow	35	Anvil	22
Axle	28	Anchor	17

Washed Wipers

Select White	20	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard	10%	Best grades	15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$30 00	$34 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	32 00	38 00
Copper sheet, tinned, 14 x 60, 14 oz.	38 00	42 00
Copper sheet, planished, 16 oz. base	44 00	48 00
Braziers', in sheets, 6 x 4 base	36 00	41 00

LEAD SHEETS

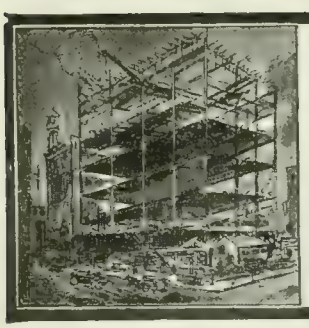
	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$ 9 50	$14 50
Sheets, 3½ lbs. sq. ft.	9 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	9 00	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

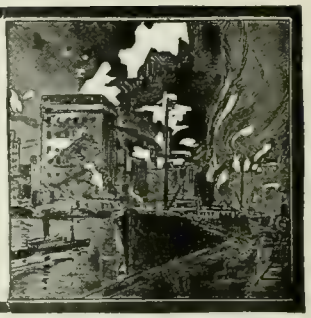
Acid, boracic	$ .25
Acid, hydrochloric	.03¾
Acid, nitric	.10¼
Acid, sulphuric	.03¾
Ammonia, aqua	.20
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.18
Copper, carbonate, annhy.	.35
Copper, sulphate	.10
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	16½
Nickel carbonate	.30
Nickel sulphate	.17½
Potassium sulphide (substitute)	.40
Silver Chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite per 100 lb.	6.50
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



Trade Gossip

Wants Equipment.—Fred E. White, 163 Rothesay Ave., St. John, N.B., advises Canadian Machinery that he is in the market for some machine shop equipment. No other particulars were furnished.

Wants Garage Equipment. — P. A. Wagner, of Wellesley, Ont., wants some used equipment, as follows: Drill press to operate with power, power hacksaw, several grinders, and a couple of other machines.

Business Is Good.—Mr. P. Pocock, of the London Concrete Machinery Co., states that business in their line never was better, and is now away ahead of last year. The war hit this line of trade particularly hard, but it is now experiencing a remarkable recovery.

Operate in June.—Engineer Clark, in charge of the construction programme at the C.P.R. creosoting plant at Sherwood, on the outskirts of Sudbury, stated that he expected the plant to be in operation towards the end of June. Some 80 men are employed at the present time, but no more are being taken on. When the plant gets under way over 300 men will be employed.

Agency Changes.—The Modern Tool Co. announce arrangements whereby the E. L. Essley Machinery Co., 551-557 Washington Blvd., Chicago, Ill., become exclusive selling agents in Chicago territory for Modern and Universal grinding machines. In addition to a large sales force working from the Chicago headquarters it has branches in Milwaukee, Wis., and Moline, Ill. The Modern Tool Co. will also have their own grinding expert stationed at the Essley headquarters.

A Busy Place.—The National Steel Car Company, of Hamilton, has orders on its books involving an aggregate of $14,000,000. The company is operating at capacity in its rolling stock department and is also busy in the manufacture of motor trucks. The potential requirements of cars for the Canadian railways give the car builders of the Dominion a favorable outlook for the future, and the volume of orders held by the National Car Co. gives assurance of active operations for the next few months.

Buying More Equipment. — Assured that the debenture issue for the city's railway, the London & Port Stanley, will be approved by the Provincial Legislature, Vice-Chairman Philip Pocock announced the programme that will be put into effect as soon as the City of London Bill has received the Legislature's sanction. A new electric engine will be purchased and put into use for the summer excursion traffic, at least six new cars are to be added to the road's rolling stock, and the L. & P. S. shops are to be enlarged.

Business Is Better.—The Perfect Machine Co., Galt, Ont., informed Canadian Machinery that business, as far as they were concerned, was on the upgrade. They have had quite a few nice orders lately, and have good prospects of others in the near future. They are bringing out a new 18-inch drill press of the upright type, to be known as their No. 19 drill. This machine will be equipped with power feed and back geared. The design is being kept as simple as possible, all non-essentials being eliminated.

No Depression. — That Peterborough industries have not suffered as have those of many other cities during the present period of depression is indicated

MEN WERE GIVEN ACCESS TO THE BOOKS AND RECORDS OF COMPANY

HAMILTON.—The Industrial Council of the International Harvester Co. has been called upon to fix the wages of the plant, about as severe a test as could be put on the organization.

On Friday of last week bulletins containing the report of the works council of the International Harvester works on the question of wage reduction were posted in the various departments of the big plant here. The report was issued yesterday, and is said to be the unanimous finding of the council, which consists of eight representatives of the employees, elected by the workers in the different departments, and an equal number of representatives of the company. The workers' representatives spent five full days in investigating the company's books concerning cost production, orders and other matters, and went into the wage returns of all the employees. As a result, the members reported, among other things, that:

"We, the employee representatives, find that owing to the lack of orders on account of the high cost of machines and large stock on hand, the company's proposed reduction of 20 per cent. on day and piece rates, and 10 per cent. on salaries, seems necessary, and wish to go on record as regretfully accepting same in hope that the plant may be kept running.

"After carefully reviewing the reductions made so far, and the further reductions necessary to meet the objective asked for, and having tried in every way, without success, to find some other way of accomplishing the result, we endorse the present method of reducing the day and piece work rates in force November, 1920, until a total reduction of 20 per cent. is reached."

The wage reductions made so far by the company on the November scale average 13½ per cent., and according to the finding of the council the company is warranted in making a further cut amounting to 6½ per cent.

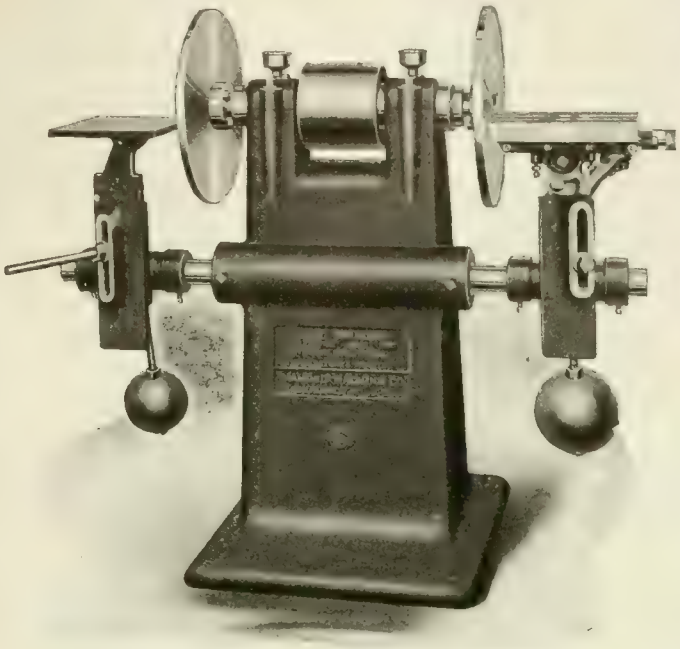
The council presented its report to F. J. Gernandt, the local superintendent, who expressed satisfaction at the finding, which he believed would be the means of averting a shutdown of the plant and turning over 1,500 hands out of work.

The works council of the Oliver Plow Works, a subsidiary of the International Harvester Company, is now preparing a report.

Report Well Received

It is stated the finding of the council has been well received by a majority of the hands employed at the Harvester works, and will be the means of steadying the labor market, it is thought, by many other workers.

An explanation in regard to the 10 per cent. cut in the price of the company's products not taking place till next year was made by an officer, to the effect that the product marketed this year was made up months ago, with wages and material at the top price.



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Good grinding in fast time has made the Diamond popular in a host of shops. The right design and build eliminate vibration and give the operator a perfect surface every time. There is a suitable size and equipment for every surface grinding job you have. Workmanship and material of "Diamond" quality throughout.

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WINNIPEG, VANCOUVER

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At the UNITED STATES ARMY BASE, Port Newark, N.J.
Tuesday, Wednesday and Thursday, April 26-27-28, 1921
At 10 a.m. each day.

MACHINE TOOLS—Including Blowers, Crane Parts, Milling Machines, Chucks, Grinders and Grinder Parts, 40-30″x28′ Niles-Bement-Pond Gun Boring Lathes, 2 Bridgeford Heavy Duty Gun Boring Lathes 36″x44′, Cut Off Machines, Textile Machinery, Pumps, Presses, Slotting Saws, Tanks, Grinding Wheels, Electric Equipment, Motors, Dynamos, etc.; Furnaces, Reaming Machines, Cochran & Bly Metal Saws, Spotting Machines, Hand Milling Machines, Bench Milling Machines, Riveters, Cutter Grinders, Profilers, Polishing Jacks, Internal Thread Milling Machines, Spline Milling Machines, Rifling Machines, Brown & Sharpe Yarn Reels, Atlas Shredders, Spencer Oilers, Pickers and Picker Feeds, 197 Barrel Drilling Machines, 91 Barrel Reaming Machines, Rifling Machines, Centreing Machines, Stamping Presses, Barrel Grinding Machines, 175 Profilers, Horizontal Drills and about 100 Defiance Wood Working Tools of various kinds, including Shapers, Drills, Boring Machines, Turning Lathes, Saws, etc.

MISCELLANEOUS SUPPLIES—Including High Speed Steel, High Speed Steel Tools, Pillow and Snatch Blocks, Small Tools, Copper Bars and Scrap, Brass Rods and Scrap, large supply of Milling Cutters and Reamers, Pipe Fittings and Supplies; Fuses, Gaskets, Gauges, Hangers and Shafting, Paint and Oils, Pulleys, Taps, Miscellaneous Electric Supplies and Steam Shovel Parts, Lathe Parts, Electrical Equipment, etc., etc.

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by the exceptionally heavy freight shipments from this city since the first of the year, according to A. McNab, local agent for the Grand Trunk. The Peterborough Cereal, Canadian Packing, De Laval, Peterborough Milk Products and Canadian General Electric Company have maintained particularly steady shipments, Mr. McNab said. Outside of the textile industry depression has not been noticed locally this winter.

Fosdick Announcement.—The Fosdick Machine Tool Company, of Cincinnati, Ohio, makers of heavy duty radial drills and upright drills, have taken over all patents, drawings, patterns, jigs and fixtures covering the line of Pierle quick change, high speed, ball bearing, sensitive drill presses, from the R. K. Le Blond Machine Tool Co. This acquisition by the Fosdick Machine Tool Co. will give them a complete line of drilling machinery consisting of heavy duty radial drills, heavy duty upright drills and gang drills, and high speed sensitive single and multiple spindle drills.

Make Metal Signs.—Announcement is made of the reorganization of the St. Thomas Metal Signs, Ltd., under a Dominion charter for $100,000 capitalization, with F. W. Sutherland, president of the Sutherland Press, Ltd., named as president and treasurer of the new company and James T. Stewart of Springfield, Ohio, vice-president and general manager. Plans for the future development of the concern, which is the only one of the kind in Canada, are already under way and include the erection of a new factory building. The old company was formed two years ago and during that time has manufactured nearly $300,000 worth of metal signs.

Report Favorable.—A favorable report has been submitted by the engineers investigating the prospects for the manufacture of steel on the British Columbia coast by British industrial interests. It is several months since the announcement was made of the incorporation of the Coast Range Steel Company with a heavy authorized capitalization. It is understood that the investigators have advised the British capitalists that all the materials and facilities necessary for the manufacture of steel on a large scale are available, including hematite, magnetite, coal, and the various fluxes. An announcement as to preparations for manufacture is expected from the Britishers who are interested in the venture.

New Plant in Galt.—Speaking to Canadian Machinery relative to their new plant, the High Speed Tool Co., Galt, Ont., stated they hope to commence operations within a week. They will produce a full line of high speed tools such as taps, dies and gauges, also cater to work on special forming and blanking dies, jigs and fixtures. They intend specializing on their line of thread gauges, and speaking of the method of heat treatment they will employ, they stated it is an entirely new method in this country. It is said to be a process that is particularly applicable to tools such as taps, etc., where scale is not permissible. Electric furnaces will be used for heating.

Will Extend Plant.—Plans are under way for extensions to the John Inglis Co. plant, Toronto. Wm. Inglis, speaking to a representative of this paper this week, said the biggest part of their business at the present time was repair work, which showed that many firms are in need of new equipment. Mr. Inglis felt that an adjustment of the wage question and a restoration of the public confidence in the matter of steel and other raw materials would go far toward re-establishing business on a firmer basis. His organization is spending $75,000 on improvements for their machine shop, boiler room, foundry and on the plant generally. This, said Mr. Inglis, shows what faith they have in the future. Mr. Inglis said they had been negotiating for some time for the purchase from the city of some land directly across the road from their present site, and that he hoped to be in a position to close this deal and proceed with the building of a new foundry without further delay. Mr. Inglis left the city on Friday on a business trip to Chicago.

W. L. Jepson, of Niagara Falls, was at a special meeting of the city council appointed city engineer at a salary of $3,000, his duties to commence immediately. D. H. Fleming, of Owen Sound, had been appointed, but his resignation was not accepted by the Owen Sound council.

SHORT TRADE NOTES

E. W. Brocklebank, Arthur, Ont., is in the market for a 60 to 85 horsepower steam boiler and 50 to 75 horsepower engine.

The Hall Zryd Foundry Co., Ltd., Hespeler, Ont., is in the market for several motors, second-hand preferred, of 15 to 30 horsepower, 550 volts, 25 cycle, three phase, 750 r.p.m.

Fire, March 28, at the plant of the Record Foundry & Machine Co., Moncton, N.B., damaged the warehouse and shops to the extent of $70,000. Rebuilding will start immediately.

The Corundo Steel Co., Ltd., has acquired the plant of the Record Foundry & Machine Co., 17 Mill Street, Montreal, for the manufacture of cutting and percussion tools from low grade steel by a special chemical heat treating process. Oscar Schenck is managing director.

Two new industries, the Fuller Brush Co., Hartford, Conn., and the Coffield Washer Co., will establish plants in Hamilton, Ont., according to C. W. Kirkpatrick, industrial commissioner. The Coffield Washer Co., which has just been incorporated, will manufacture a new type of electric washing machine and will erect a factory.

The General Forgings & Stampings, Ltd., Merritton, Ont., has been incorporated with a capital stock of $900,000 by William S. Morlock, 107 Roxborough Street West; Sydney E. Wedd, 85 Bay Street; Roy B. Whitehead and others, all of Toronto, as provisional directors, to take over as a going concern the plant and business now being carried on by the General Forgings & Stampings, Ltd.

BLAME LACK OF PROTECTION FOR CLOSING OF PLANT AT LONGUEUIL

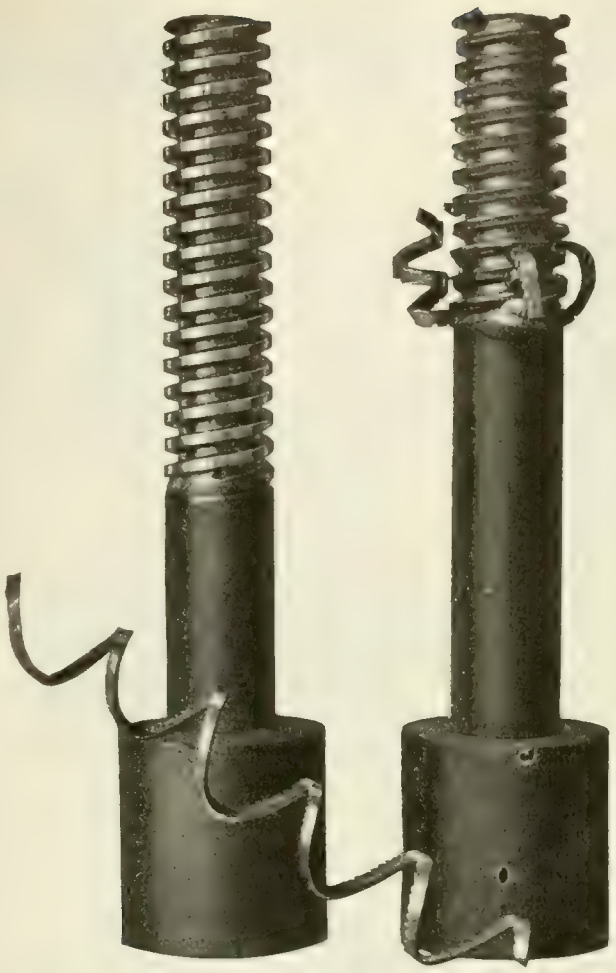
It is understood that Armstrong, Whitworth of Canada, Ltd., are contemplating closing down their works at Longueuil.

On behalf of the management it is stated that owing to the failure of the Dominion Government to give them any tariff protection on the manufacture of locomotive steel tires they closed down their tire mill some twelve months ago, and will not reopen their mills again until such protection is given. Most of the raw materials they require have to be brought from the United States and are dutiable. No protection, however, is afforded them under the Dominion tariff for their finished product. This tire mill is the only one in Canada. Messrs. Sir W. G. Armstrong, Whitworth & Co., Ltd., the famous engineers and shipbuilders of England, commenced building these works in 1914, and installed all the latest machinery. Owing to the outbreak of the European war, it was difficult for them to supply the necessary technical operators from their own works in England.

About six months ago they sent D. E. Grant to go into the situation and after being in London for some weeks he has just returned to Canada.

Armstrong, Whitworth & Co. of Canada, Ltd., will carry on their agency work on behalf of the parent firm, and the firms who are allied with them, and will continue to dispose of their stock of small tools and tool steel, water turbines, dock machinery and such like, including the Armstrong Siddeley motor car.

If this business develops as they anticipate, they intend to consider seriously the establishment of such a plant in Canada. They are already discussing some large propositions for the development of Canadian resources.



It Was Just A Matter of Grinding

The same set of Thread Chasers cut these two threads.

Observe what a clean cut the Chasers gave on this open hearth stock after they had been correctly ground. Note how neatly the Chasers curled out the chip. Before given the right form of grind, the Chasers simply pushed out the stock.

How To Grind Thread Chasers

Instructions for the Care of Thread Chasers are very completely given in a 27-page booklet published by us.

The Book Is Free

To those having the care of Thread Chasers.

It is printed and distributed with the hope that the rules given will be followed, and if they are, it will be the means of an inestimable saving of time, money and trouble.

If you have anything to do with the care of Thread Chasers, ask us for the book. Although there is no charge for the book, it is full of value. It will cost you the price of a postage stamp only, and will save you trouble, increase your value to your employer and save a lot of money that is needlessly wasted in time and scrapped work.

GEO MET RIC

Right on the Lead

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, St. John, N.B., Halifax, N.S.

If interested tear out this page and place with letters to be answered.

MONTREAL NOTES

Rumors that were prevalent some months ago regarding a large match factory that was to be built in Canada by British manufacturers seem now to be on the point of consummation, as it is stated that Sir Alexander Maguire, of the firm of Maguire, Patterson and Palmer, will shortly come to Montreal to negotiate for the erection of the necessary factories in this district.

* * *

The "Canadian Commander" and the "Canadian Leader," the last two ships constructed by the Canadian Vickers Company for the C. G. M. M., are just about completed and will undergo their final tests by the builders this week, before being handed over to the owners. The first named will be placed on the India and Far East service, under the command of Capt. M. Robertson, while the Leader will be in charge of Capt. J. D. Mackenzie and will make her maiden voyage to Australia and New Zealand by way of the Panama Canal.

* * *

At a recent luncheon of the Co-operative Electrical Society, J. D. P. Coats, of the Marconi Wireless Company, gave a short address on the subject of wireless 'graph and 'phone, accompanied by practical demonstrations. An interesting feature of the meeting was the listening to a concert being given at the plant of the company many blocks away. Mr. Coats stated that similar concerts were given at the Montreal plant every Tuesday night, and these were enjoyed by a large number of amateur wireless operators throughout Eastern Canada.

* * *

Efforts are being made by the Canadian Workers' Federation of Returned Soldiers and Sailors to hold a mass meeting in Montreal shortly, at which the Hon. C. C. Ballantyne will be asked to preside. At a recent interview with the Minister in Ottawa, a deputation of the workers received his promise to give consideration to the matter of providing work for this class of worker, but could make no definite statement as to the shipbuilding program of the Government. In stating their requests to the Minister it was asked that should contracts be awarded by the Government for the construction of new vessels that favorable consideration be given to Montreal as the place of construction.

* * *

Announcement has been made by the Marconi Wireless Company of Canada that they are constantly receiving messages at their Common Street station in Montreal, direct from Clifton, Ireland. It is only recently that such messages have come through without relay, and this achievement emphasizes the progress this company is making in the development of wireless apparatus. This local station was erected primarily for experimental purposes for the study of static conditions, so that it is with no small degree of satisfaction that equipment has been produced to receive and record uninterrupted messages over this great distance. Direct communication between Montreal and the Continent seems an early possibility.

* * *

Joliette Castings and Forgings, Ltd., of Joliette, Quebec, have recently completed the installation of a one-ton Greaves-Etchells electric furnace for the manufacture of manganese steel and alloy steel castings, particularly for the making of wearing parts for mining machinery. They have likewise installed a new five-ton Northern Electric travelling crane in the new building and extended the cleaning shop 100 feet, with a width of 40 feet, in which is installed a new continuous car annealing furnace and a complete oil storage and pumping system. They have also built a new sand blast house equipped with Pangborn sand blast. A new power house and machine shop has been erected with the necessary machinery for facilitating delivery of finished castings and specialties.

PLANT WILL HAVE GREATER CAPACITY

Changes Being Made To Give Larger Output for Electrical Apparatus.

Owing to the substantial development that has taken place in the electrical equipment business of the Canadian General Electric, it has been found necessary to take over some of the space that has formerly been included in the Allis-Chalmers plant.

This will be utilized after the necessary equipment has been secured, some of which will be taken from other plants, for the making of transformers.

Mr. J. J. Ashworth, general manager of the Canadian General Electric, intimated that it would take some time to finish making the change, but that when completed the plant would be capable of much greater production of electrical equipment.

The plans of the company also call for the disposal of a large amount of used machinery, part of which was used in their war contracts.

From 125 to 130 different weights of metal lath were in common use a short time ago. Through a conference with the Bureau of Standards, it now appears, manufacturers have agreed to reduce the number of weights of metal lath to three.

CHANCES TO MAKE NEW CONNECTIONS

Some of These Lines May Come Within the Scope of Output of Your Factory

Canadian firms interested in any of these items should write Canadian Machinery for particulars, mentioning the number in each case.

2858. A London firm desires the addresses of Canadian producers of cobalt ores.

2856. **Belt dressing.** — A Manchester firm wishes to place on the Canadian market a new solid non-slip belt dressing and are prepared to appoint agents in Montreal, Toronto, Winnipeg and Vancouver.

2857. **Electrical supplies.** — A Manchester firm would like to hear from any Canadian manufacturers of electrical goods (specialties in particular) likely to be saleable in the United Kingdom.

2907. **Asbestos, leather belting, electrical material and other technical articles.**—A Milanese house is anxious to open up correspondence with Canadian firms.

2908. **Machinery, rubber goods.** — A firm in Milan would like to establish relations with Canadian firms exporting machinery and rubber goods.

2913. **Hardware and metals.**—A firm in Belgrade, Jugoslavia, would be interested to hear from Canadian exporters of hardware, iron and steel and other metal lines and agricultural implements.

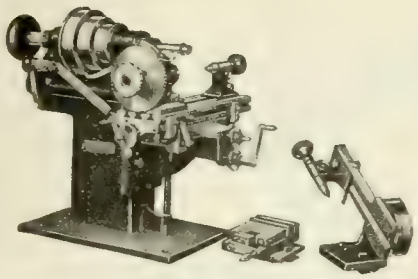
2904. **Industrial and agricultural machinery, safes, etc.** — A Sicilian firm would be glad to hear from Canadian houses dealing in industrial and agricultural machinery, safes, etc. The firm is also disposed to represent Canadian firms.

Personal

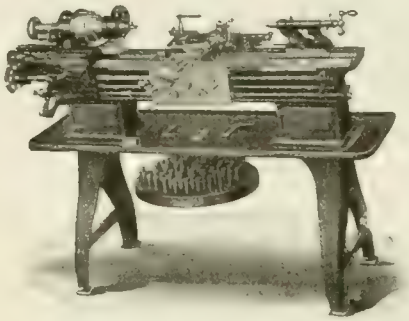
The marriage took place at Kingston, at the home of the bride, Alwington, of Miss Mabel Ford Richardson, youngest daughter of the late Senator Henry W. Richardson, and Henry Graham Bertram, of Dundas, Ontario. The groom is chief engineer of the John Bertram and Co. works in Dundas.

At a meeting of the directors of the Stanley Steel Co., Hamilton, held this week, Lt.-Col. Harry Hatch was elected vice-president and general manager of the concern. Col. Hatch graduated in mechanical engineering from Queen's University. Previous to the war he was purchasing agent for the Canada Steel Goods Co., of which his father is president. He served with distinction with the 19th battalion in the great world war. On his return he was made assistant superintendent of the Stanley Steel Works at New Britain, Conn. His latest promotion is a most important one for a young man and he will receive many congratulations.

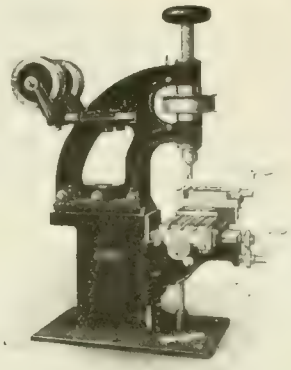
METAL and WOODWORKING MACHINERY of all Kinds



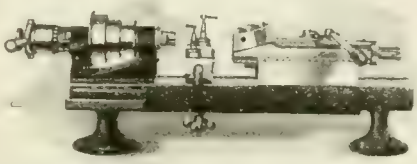
Cataract Bench Miller, with Horizontal Head.
(Details in No. 15 Catalogue.)



Cataract Quick Change Swing Precision Lathe, with Cone Drive.
(Details in special Catalogue.)



Cataract Bench Miller, with Vertical Head.
(Details in No. 15 Catalogue.)

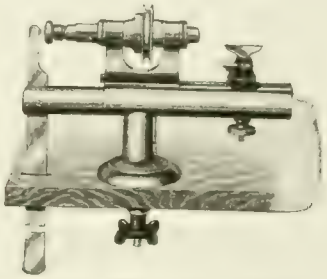


Cataract Bench Lathe with Turret Double Tool Cross Slide and Chuck Closer for the Manufacture of Duplicate Parts.

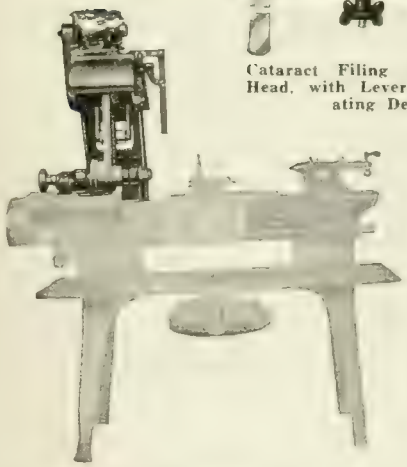
"CATARACT"

All those features which make a tool worth while—accuracy, finest materials and workmanship, unexcelled finish and interchangeability of parts that really interchange—are incorporated in the entire line of tools manufactured by Hardinge Brothers of Chicago.

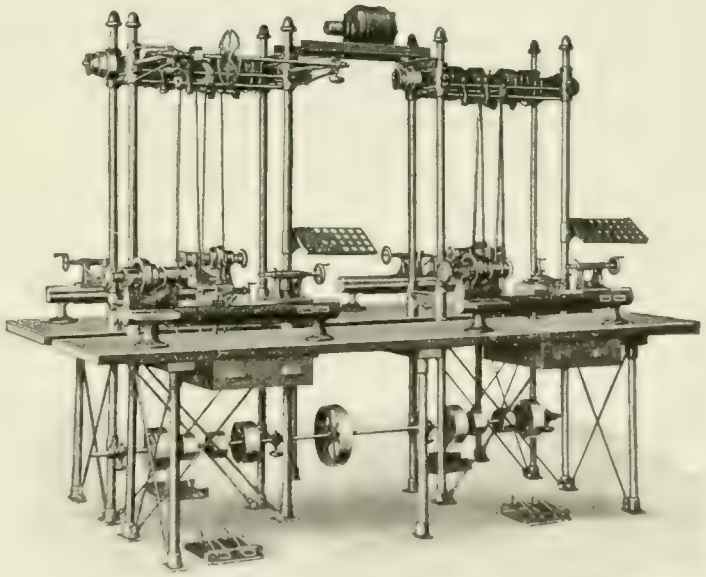
Write us for full particulars.



Cataract Filing and Polishing Head, with Lever Chuck Operating Device.



Cataract Quich Change Swing Precision Lathe, with Motor Drive.



Cataract R-1 Double Bench Unit with Under-Drive.
(Details in No. 15 Catalogue.)

The equipment shown above being self-contained, is particularly well adapted for tool room work, the manufacturing of duplicate parts, or for optical and jewelry manufacturers and all precision work.

G&W MACHINERY

GARLOCK-WALKER MACHINERY CO. LIMITED

32 FRONT ST. WEST. **TORONTO** TELEPHONE MAIN 5346

STANDARDIZING PARTS OF FARM MACHINERY IS BEING UNDERTAKEN

OTTAWA.—A. B. McCoig, member for West Kent, has made some progress with his plan for having parts of agricultural implements standardized in Canada, so that it will be easy for farmers everywhere in Canada to get repairs. The sub-committee was named by the agricultural implement manufacturers and was informed by the latter of various difficulties in the way of standardization, but it was agreed that in some respects the scheme was feasible.

Samples were submitted of ledger plates, sections and guards, as well as parts of cutting-bar by the Massey-Harris and International Harvester companies, and parts of plow-points and plow-point bolts by the Cockshutt and Verity Plow companies.

Speak for Makers

The representatives of manufacturers present were as follows: A. W. Wallace, International Harvester Co.; George D. Graham, Frost and Wood Co.; T. Whitecomb, Smith's Falls; W. S. McFarlane, Cockshutt Plow Co.; W. A. Watts, Massey-Harris Co.; E. F. Bolte, A. L. Upton, International Harvester Co.; Wm. J. Verity, Verity Plow Co.; Messrs. George Valentine, T. Bradshaw and J. G. Hossack, of the Massey-Harris Co.

The sub-committee who met them were the chairman of the agricultural committee, Mr. R. C. Henders, and Messrs. McCoig, Harold, Wright, Nicholson and Dr. J. H. Grisdale, Deputy Minister.

Representatives of the manufacturers argued that to standardize these different parts would be to create a new group of articles which would add to the burden of local agents in the way of repairs to be carried, and also that it would interfere with the improvement of different machines or implements affected. After further parley, however, it was conceded that very material progress might be made toward standardization in the following cases:

Five Special Cases

Ledger plates, as to shape and attachments.

Sections, as to location of rivet holes.

Plow-points, as to location of bolt holes and shape of same.

Plow-point bolts, as to shape.

Sprockets and sprocket chains, nuts for wagon skeins, and nuts and bolts generally.

At a subsequent meeting among themselves, the representatives of the manufacturers passed the following resolution:

"That the representatives of the implement companies present at the meeting of the agricultural committee are of opinion that a measure of standardization is possible on many of the articles considered and discussed with your sub-committee this morning. It will, however, be recognized that any change, even of a minor character, which may be made in agricultural implements may involve important manufacturing considerations, and therefore it is suggested that a board composed of expert engineers, to be named by your committee, and representatives of agricultural implement manufacturers, be constituted to investigate and make recommendations."

This was approved by the sub-committee and was embodied in the report to the main committee, which so reported to Parliament.

BIG RECOVERY IN MICHIGAN PLANTS

Steadily Moving Toward a Period of Normal Production—What Figures Say.

Detroit.—According to compiled statements by secretaries of more than a score of Michigan cities, the State's industries show a recovery of 47 per cent. from the low ebb of the readjustment depression during the first two months of the year in the number of workers actually employed.

The improvement which set in about the middle of the first quarter of the year has gradually gained momentum until leaders in all parts of the State foresee steady progress toward normality, even though that goal is not yet in sight.

Figures compiled in the larger cities of the State indicate that their normal working forces aggregate 404,900, while at the low ebb of depression they had been reduced to 122,940. The number of men at present employed in these cities is 235,140.

SIGNS OF PROGRESS

The contract for the plant to be erected this spring at Brandon, Man., for the Imperial Oil, Ltd., at a cost of $225,000, has not yet been let. The warehouse will be 50 by 200 feet and will be of reinforced concrete. A boiler house, which will be separate from the warehouse, will be 20 feet by 30 feet and the garage 40 by 50 feet. Local manager, D. S. L. Patterson.

The million-dollar concentrator of the Britannia Mining and Smelting Co., Ltd., Britannia Beach, B.C., which was recently destroyed by fire, will be rebuilt. General manager, E. J. Donahue.

The erection of a temporary station in the South Ward, near Queen Street, Kitchener, Ont., is contemplated by the Grand Trunk Railway.

Estimates are being prepared for the new arena and ice plant to be erected at Ottawa shortly. The arena will be situated at the corner of King Edward Avenue and York Street and will have a cold storage plant in connection with it.

MACHINERY TRADE DULL IN GERMANY

New Political Conditions Cause Some Uncertainty Regarding Operations of Future

Berlin, Germany. — The machinery trade reports declining business. The political situation has added weight to a situation that was already bad. Foreign buyers are holding off, because they want to see whether Germany can produce successfully under the changed political conditions just forced upon Germany. It goes without saying that home buyers are also placing few orders in view of the uncertainties of the outlook. There is some inquiry for heavy machine tools; buying, however, is light. Locomotive shops have recently taken orders for about 80 locomotives for Spanish railroads, and last month it was announced that the Soviet government had arranged for 1,000 locomotives in Germany, of which 100 would be built at once. These orders were to be distributed among 19 shops. At the same time it was published that in a foreign competition for locomotive parts for Russia, German shops secured 80 per cent. of the contracts.

The German machinery trade has just organized a working council, composed equally of employers and workmen, whose object is to promote harmony in the relations of the two parties. It will also seek to reduce the costs of production through standardization and specialization of product.

LARGE SUPPLIES OF WAR MATERIAL

Thousands of Tons of Forging Billets Have Never Been Cleared Out of Stock

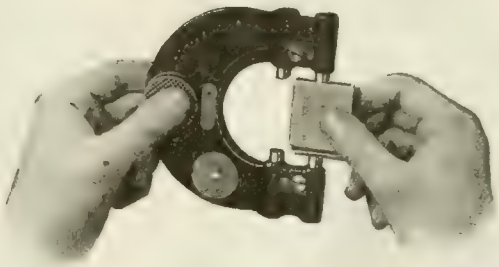
Prices to be asked by the Bureau of Supplies and Accounts, Navy Department, for the 20,000 tons of surplus steel it is to offer in the open market will be fixed at 10 per cent. less than the United States Steel Corporation bases, it is understood. Work of completing the catalogue listing the steel, most of which consists of forging billets, will be completed in about ten days. Other material in the list is comprised of plates and shapes, medium high tensile and galvanized; bars in cold-rolled, medium black and nickel, and billets, blooms and slabs, including mild steel and steel in carbon and nickel. In case the Steel Corporation prices should be changed, it is believed that the bureau would readjust its scale so as to be 10 per cent. under the prices of the Corporation.

Tonnage at Gulf and Atlantic coast navy yards will take no addition for freight, while that on the Pacific coast will carry a freight rate of 88¾ cents, based on the Government bill of lading taking a deduction of 33 1-3 per cent. under the commercial rate of $1.33.

Aikenhead's

"Everything in Tools"

The reputation of a manufacturer's product is his greatest asset. The firm which represents him to the purchaser must have a reputation equal to his own. Aikenhead's is the Canadian headquarters of many makers of the world's finest tools.



Johansson
Snap Gauges

The adoption of Johansson Gauges all over the world is due to two great factors—**they make short cuts in production** and **cut manufacturing costs.**

You will find Johansson Gauges are considered as essential shop equipment in those shops where economy and efficiency are carefully studied.

Johansson Adjustable Limit Snap Gauges eliminate the cost of making and maintaining solid snaps. They eliminate the tendency of the operator to work to "absolute dimension" and get results even in the hands of unskilled operators.

The Johansson book tells all about them. Write for your copy to-day.

Single Spindle Hand Tachometers

Hand Tachometers supply the need for accurate, durable and handy speed recorders for all-round use. They indicate accurately the revolutions per minute, either right or left hand, of shafts and spindles; furthermore, by using the measuring disc, periphery or surface speeds are determined. The result (either revolutions per minute or feet per minute) is instantly shown on the dial without watch-timing or calculating of any sort. The slightest variation in speed occurring during a fraction of a minute is also shown at a glance. Belt slipping and consequent loss of power is, therefore, quickly detected.

Aikenhead Hardware, Limited
17 Temperance Street, Toronto, Ont.

If interested tear out this page and place with letters to be answered.

THE "FLU" Stayed out of this PLANT

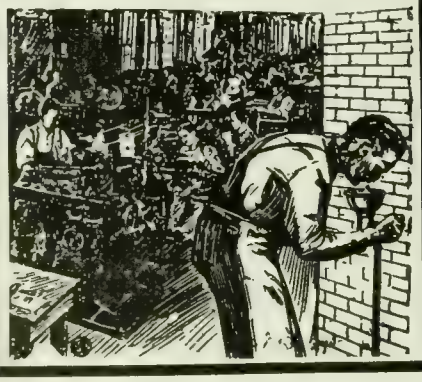
PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

The only fountain with a bowl that prevents lips touching the bubbler paid its moderate cost over and over in all those well-ordered plants whose precautionary measures successfully barred the Spanish influenza. PURO saves lives, time and water. Write

Puro Sanitary Drinking Fountain Co.

888 F. St. Andre St., Montreal, P.Q., Canada



RATES FOR CLASSIFIED ADVERTISING

Rates (payable in advance): Two cents per word. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

MUST CONSIDER THE SEVEN "M'S" OF INDUSTRY TO MAKE A SUCCESS

SPEAKING before the Pittsburgh section of the Industrial Cost Association, on March 8, 1921, W. E. Hundley brought out some worth-while facts on "Production Costs."

When we get a good general view of the big basic sources of cost, we find that the manufacturing and marketing of an industrial product involves seven fundamental factors each spelled with an "M," which might appropriately be called "the seven Ms of industry." They are Money, Millsite, Mill, Machinery, Material, Men, Management.

Each of these factors is the primary cause of certain expenditures which begin as soon as an enterprise is launched and continue as long as it exists. It is no more difficult for a capable cost accountant to classify expenditures with respect to these causes than it is for the naturalist to tell from the characteristics of a leaf the kind of tree on which it grew. They may be readily classified into three main groups: Administration, Production, Distribution.

Money, the motive-power of industry, is obtained primarily by financing the enterprise. It represents wealth accumulated by men willing to risk the loss of it by exchanging it for pieces of paper which entitle them to participate, under certain conditions, in the profits which they feel assured will be earned by the venture, and which they believe will exceed the ordinary rate of interest afforded by other investments involving little or no risk.

What the Return on Investment Is

This return, which they expect to receive on their investment, is a combination of interest for the use of their money and profit for conducting the enterprise, which should be in proportion to the risk involved and cannot reasonably be expected to approximate a fixed rate for all industries. This matter of interest and profit bears upon the problem, as it is still the storm center among professional cost accountants and engineers, many of whom contend that interest on investment must be included in determining cost of production, reasoning that an enterprise must pay for the use of capital before it can show a profit.

Millsite is not, of itself, the source of much expense, and has very little effect upon cost of production. Money spent for a millsite constitutes a permanent investment which can neither be depreciated nor appreciated, and on which no direct profit can be realized except through rental or sale. Taxes and maintenance are apportioned to production on the basis of space occupied by each department or building.

Mill constitutes an important element of investment which is slowly absorbed into cost of production through the medium of depreciation charges. It also is the source of certain expenditures which may readily be classified as "building expense," and apportioned on the basis of available floor space or cubic contents.

The Most Important Item of Investment

Machinery embraces all mill equipment directly or indirectly connected with manufacturing, is the most important element of invested capital and the source of most trouble for the industrial executive, the cost accountant and the income tax examiner, in determining cost of production. It used to be difficult to persuade manufacturers that depreciation of machinery and equipment constituted an important element of cost. Now they not only swallow depreciation but hunger and thirst for amortization, obsolescence and inadequacy.

It is most important to know the actual valuation of plant equipment; the value in use. Depreciation allowances charged into cost from year to year are merely accounting estimates and cannot be depended upon as an indication of actual depreciation. Unless the reserves set up have been properly handled the balance when deducted from the book value of the assets may show a valuation that cannot be reconciled with the actual physical condition of the equipment.

Assuming a reasonably accurate cost for machinery and equipment, we have a basis for determining the charges to be made to cost of production for the gradual wear and tear which will eventually cause the scrapping or disposal of such property, regardless of how much may be spent for repairs and maintenance. But the extent to which the repairing of machinery tends to prolong its useful life is an important consideration.

Distributing Machinery Expenses

Machinery is a constant source of expense, whether idle or operating. Idle machine expense includes the items usually referred to as fixed charges, such as depreciation, insurance, taxes, space charges, small maintenance charges. Operating machine expense covers all of the above charges plus the following, which vary more or less with production: wages of operator, indirect labor, labor expense, power, tools, supplies, maintenance and repairs, crane service, miscellaneous works expense.

Material is generally considered an easy matter to dispose of, chiefly because the tendency is to ignore most of the expenses incurred in connection with it, absorbing them as part of the "general manufacturing expense." As in the case of labor, we have both direct and indirect material costs.

Special expenses in connection with material bought for a particular job should be charged direct to the shop

order covering it, and in some cases charges for demurrage, inspection, testing, etc., might be charged direct to a department. Otherwise, indirect material cost should be distributed on some equitable basis that would take account of weight, bulk, etc.

Handling the Human Element

Men not only constitute the greatest problem in the industrial world, but are the direct source of so many expenses that cost accountants, as a rule, have used what they call "productive wages" and "productive hours" as an arbitrary basis for distributing all manufacturing expense. Such items as power, tools, supplies, repairs, etc., cannot be thrown into a melting pot called "burden," and distributed to production on a basis of wages or labor hours, if we are to get anything approximating actual costs. But we can and should analyze wages and the expenses incurred in connection with the employment and handling of men and classify them into groups.

Management affects administration, production and distribution but it presents no particular difficulties except in connection with production. Management of production involves a certain class of expenses which are variously referred to as "general manufacturing expense," "plant administration," etc. As a rule these expenses cannot be applied as direct charges to productive processes or operations, but there is one element that is frequently separated and handled as a productive department. Engineering and drafting can and should be handled on an hourly basis, each shop order or department being charged with the direct time of engineers and draftsmen, as reported daily, and a cost rate established to absorb all salaries and expenses.

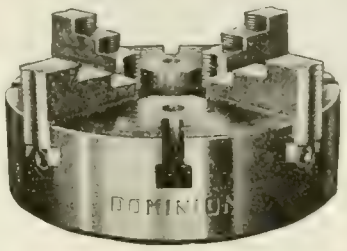
CUTTING PRICES TO HELP TRADE

Following Action of Steel Corporation, Action Is Taken By Some Large Firms

Chicago.—Basing its action upon the recent reduction in steel prices announced by the United States Steel Corporation, the International Harvester Co. announced a straight 10 per cent. reduction effective next year, on products in which steel is the principal raw material.

"The reduction on steel came after one year's product had been provided for, and will have no bearing on the cost of machines we sell this year," the announcement explained.

The company announced reductions of from 10 to 15 per cent. in machines made principally of wood and iron on March 7. The announcement of the more recent cut said that the new changes cover all machines not affected by the March 7 cut.



DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY

All Screws Are Reversible

SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.

DOMINION STEEL PRODUCTS CO. LIMITED
Engineers • Manufacturers
BRANTFORD, CANADA

PATENTS
ATTORNEYS

DROP FORGE DIES
Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.
THE KIMBER & HILLIER MFG. CO.,
Thorold Road, - St. Catharines, Ont.

PATENTS
Fetherstonhaugh & Co.,
The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada. Booklet Free.

HAMILTON ENGINEERING SERVICE
LIMITED
Consulting and Designing Tools, Jigs, Fixtures and Special Machinery. Let us shoulder your problems.
17 MAIN ST. EAST, HAMILTON

Rubber Mill
MACHINERY
BERTRAMS LIMITED
SCIENNES EDINBURGH

MACHINE AND BENCH VISES
Write for Prices
Superior Machinery Co., London, Canada

J. SMITH
BELTING
158 YORK ST. TORONTO

BLACK DIAMOND OVENS
OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet
Brantford Oven & Rack Co. Ltd.
Brantford, Canada

Classified Opportunities

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

MACHINERY WANTED

WANTED — WOODWORKING MACHINERY and mining machinery, machine tools, boilers and steam pumps, alternating or direct current motors. Contractors' equipment. Apply Box 737F, Canadian Machinery.

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

Used Belting, Pulleys, Etc.

We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

PARTIAL LIST

Machine Shop Equipment

At Extremely Low Prices

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long, ⅜ in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

Standard Equipment & Tool Works

Dept. K. 307 St. James St.
Main 2286 MONTREAL
(20)

ANNOUNCEMENT

The Electric Motor and Machinery Co., Ltd., 64 Wellington Street West, Toronto, Ontario, wish to announce the commencement of their sales agency for the

Howell Red-Band Motors Ltd.,
makers of "the Guaranteed Motor."
(c19m)

Sales Engineer wants to sell gasoline or oil engines, portable, stationary and marine or other machinery, to jobbers and dealers in the Province of Quebec or whole of Canada. Sold total output of one factory last year. Expenses and commission basis preferred. Box 768, Canadian Machinery. (c17m)

The advertiser would like to know where you saw his ad.—tell him.

Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
THE KATIE FOUNDRY, GALT, ONT.

REGO
WELDING
and
CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

Carter Welding Co.
of Toronto, Limited
7-11 Sheppard St., Toronto, Ont.
Phones: Adelaide 2841 and 1524
(TF)

CLOSING TIME

Advertisements for this section must be in our composing room Tuesday morning prior to day of issue.

In order that the announcements of your wants, machinery for sale, etc., etc., shall not be delayed, please try to have them in our office with the Tuesday morning mail.

Canadian Machinery

AGENTS WANTED

AMERICAN FIRM, SPECIALIZING IN OXYacetylene welding and cutting equipment, is desirous of securing representatives and agents in Canada. Apply Box 763F, Canadian Machinery.

BUSINESS CHANCES

WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (ctfm)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

PERFECT MACHINE COMPANY, GALT
Builders of Reliable Machinery.

Phone Park. 3550 House: Coll. 9660W
197 Clinton Street, Toronto
A. AUSTIN
GENERAL MACHINE WORK
Turret Lathe and Automatic Screw Machine a Specialty. Let us quote on your work.
With: Garlock, Walker Machinery Co.
163 Dufferin Street.

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Have you tried out the Classified Advertising Section yet? If you haven't, send in copy to-day for next week's issue.

Canadian Machinery
Classified Advertising Section
143-153 University Avenue
TORONTO

Classified Opportunities

CANADIAN MACHINERY wants a representative in every town and city where there is a metal working plant or large machine shop.

We require first of all the ability to demonstrate to mechanics the value of reading technical journals in general and CANADIAN MACHINERY in particular, and to secure their subscriptions.

Second—we want men who can tell news when they see it. Not necessarily men who can write, but men who are alert for news, and who will give us the facts, briefly and plainly.

Canadian Machinery and Manufacturing News

143 University Ave. Toronto, Ont.

I am still offering machines equal to new at fifty cents on the dollar. I do not have the largest stock in Canada but I do quote the lowest PRICES

LATHES	PUNCHES
DRILLS	PRESSES
SHAPERS	SHEARS
MILLERS	ENGINES
BOILERS	BORING MILLS
GRINDERS	MOTORS

YOU can always save money and secure guaranteed equipment and production at prices that will encourage and convince the most cautious buyer if you will only send your enquiries to the man who can convince you and that man is

R. S. HOLLY

Suite 502, Kent Building, Toronto, Ont.

Phone, Adelaide 3147

Special Machinery Manufacturers

We have frequent requests from manufacturers in the United States for information regarding Canadian firms who are equipped to manufacture their line.

We would like to receive, therefore, the names of any firms who might be interested in inquiries of this kind. We desire the following information:

Name of firm and full address.

Description of shop and equipment.

Particulars regarding regular line, if any.

Class of work interested in securing and best equipped to handle.

Foundry equipment or connection.

This information will be filed and other necessary particulars forwarded to American manufacturers who are likely to be interested.

CANADIAN MACHINERY

143 University Ave. **TORONTO**

Speed PLUS Precision

In the design of Starrett Tools, *convenience* as well as accuracy is kept well in mind.

Mechanics who use fine tools prefer Starrett Tools not only because of their accuracy, but because of their durability and convenience.

This combination of qualities—characteristic of Starrett Tools—adds *speed* to precision in making the fine measurements of modern shop practice.

Catalogue No. 22 "3" sent free on request

THE L. S. STARRETT CO.
The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
Athol, Mass.

Starrett Bench Micrometer Caliper:
For measurement by thousandths or ten-thousandths up to one inch. Made with heavy base; very rigid and accurate.

Starrett Tools

STARRETT TOOLS

STARRETT HACK SAWS CUT QUICKER LAST LONGER

42-146

IMCO TOOLS

SPEED!

Tools capable of exceptional speed are a vital necessity to present day production. They must be capable of giving satisfaction on exacting work—even when that work is extremely urgent and *must* be rushed.

The precision possible with "Imco" Tools on speed work will convince you that they should be used on ALL your work. Try them!

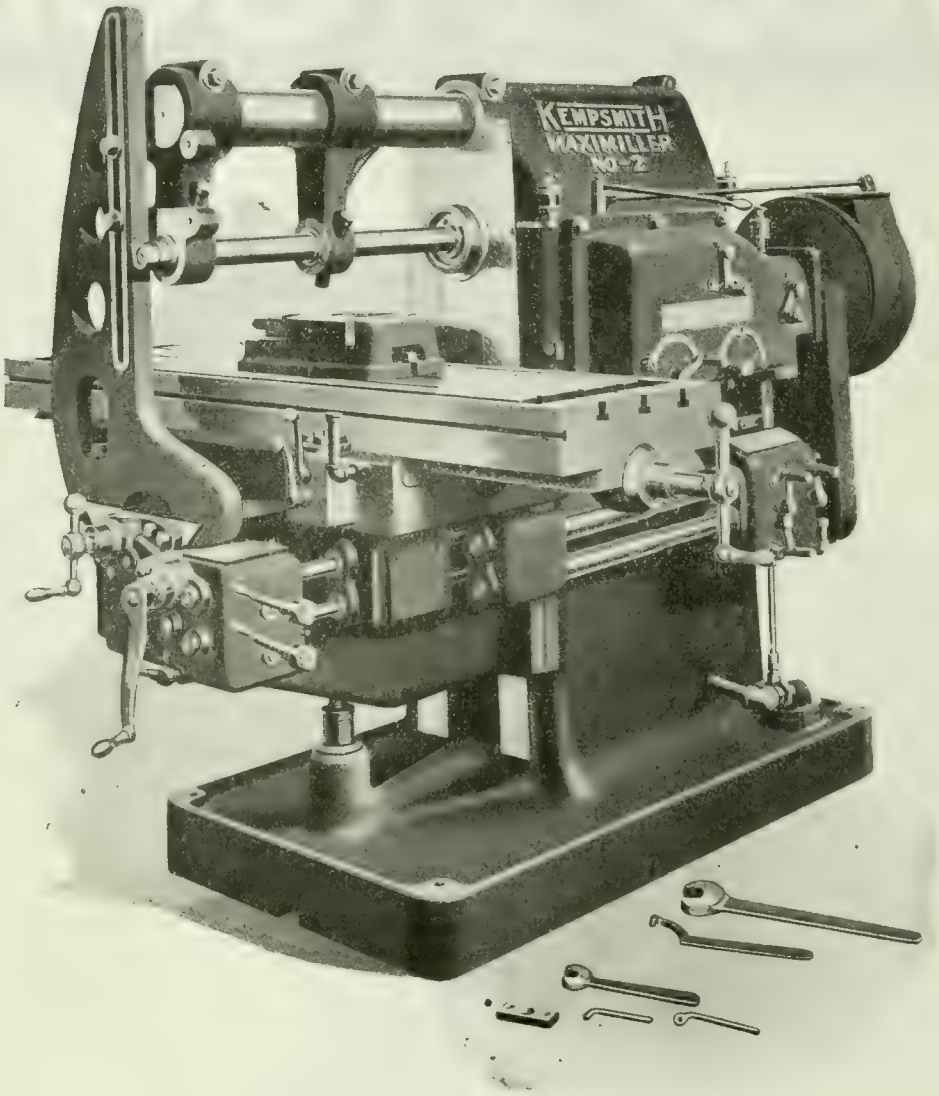
Catalog of 3 and 4 lip drills, reamers and milling cutters upon request.

Eastern Representatives:
WATT MACHINERY & EQUIPMENT CO., 344 St. James St., Montreal, Que.

Ingersoll Machine & Tool Co., Ltd.
Ingersoll, Ontario.
Toronto Office — 80 Bay St. Phone Adelaide 7227.
Chas. A. Strelinger Co. Ltd. Windsor, Ont.

If interested tear out this page and place with letters to be answered.

KEMPSMITH



No. 2 PLAIN MAXIMILLER

Kempsmith Millers are built in three sizes each in the Plain and Universal Cone Types, two sizes of Maximiller Geared Head Types, a Production Type, with a choice of three table ranges, and two sizes of Vertical Geared Head Type. Our Knee Type Millers can be fitted with a complete line of attachments, which greatly increases the range of the milling machine.

Literature will be gladly sent upon request.

THE KEMPSMITH MANUFACTURING CO.

MILWAUKEE, WIS., U.S.A.

FOREIGN DEALERS:—American Trading Co., 25 Broad Street, New York, N.Y. (Japan); Barandiaran & Co., 3-Alameda, San Sebastian, Spain; Bevan & Edwards Pty., Ltd., 117 King Street, Melbourne, Australia; Blair, Reed & Company, Nathan's Bldg., Wellington, N.Z.; Bloxham, Edgar, 12 Rue Du Delta, Paris, France; 245 W. 12th St., New York City; L. S. Devos, Grand Central Palace, New York City; Herbert, Alfred, 54 Dey Street, New York City; Nielson & Winther, Blegdamsvej 60, Copenhagen, Denmark; 24 Stone Street, New York City; Parke & Lacy Co., 60 Clarence Street, Sydney, N.S.W., Aust.; Selson Engr. Company, 85 Queen Victoria St., London, E.C., England; Corso Vittorio Emmanuele, 11, No. 9, Turin; 5 Piazzo Castella, Milan, Italy; 24 Stone Street, New York City; Pascual Teja, La Capuchinas, No. 65, Mexico, D.F.; Spliethoff, Beeuwkes & Co., Leuvehaven, W.Z., 159, Rotterdam, Holland; Turner, Hoare & Co., Ltd., Lansdowne Road, Post Box No. 195, Bombay, India; Charter & Gardiner, 55 Calle Echaque Santa Cruz, P.O. Box 1201, Manila, Philippine Is.; Societe Anonyme Belge Alfred Herbert, Rue De Laeken, 35a & 35b, Brussels, Belgium.

CANADIAN DEALERS:—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada; General Supply Co., 38 Toronto St., Toronto, Canada.

TESTED BY TIME

This Adjustable Snap is no experiment. Correctly designed to meet the severest tests, it has proven its value through years of service.

Easily set to exact sizes—rigid and dependable—economical to maintain—adaptable to different sizes and changed limits—this gage helps to reduce gaging costs.

Carried in stock for your convenience by all Johansson dealers.

Johansson Dealers

Chas. A. Strelinger of Canada, Ltd., Windsor, Ont. *Aikenhead Hardware Co., Toronto, Ont.*
Williams & Wilson, Ltd., Montreal, Que.

C. E. Johansson, Inc.

POUGHKEEPSIE, N.Y.

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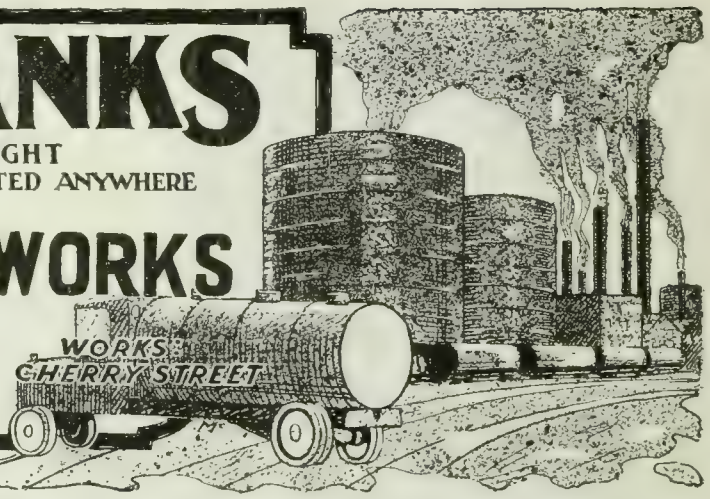
STEEL TANKS

HEAVY & LIGHT
STEEL PLATE CONSTRUCTION ERECTED ANYWHERE

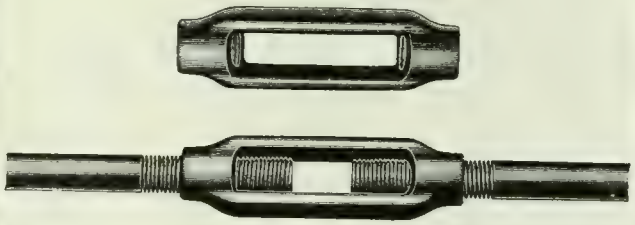
THE
TORONTO IRON WORKS
LIMITED

HEAD OFFICE:
ROYAL BANK BLDG. TORONTO



CANADA
FOUNDRIES & FORGINGS
LIMITED

Drop Forged Steel



SOLID—NOT WELDED

16 Sizes with / without } Stubs

Canada Foundries & Forgings
Welland, Ont.

Desmond-Huntington Dressers

For use on the largest and hardest grinding wheels and where quick action is desired the Desmond-Huntington is the best Dresser made. It is made in the usual Huntington form, but larger and heavier. It is filling a long-felt want to those who do not find the ordinary size Huntington Cutter efficient or durable, but who prefer a cutter of that type.

We also manufacture the ordinary Huntington Dresser and Cutter. All of our cutters are made from high-grade steel and are carefully hardened and tempered to secure that grade of hardness and toughness that will give the very best results.

The Canadian Desmond-Stephan Mfg. Co., Limited
Hamilton - Ontario

Are *YOU* Represented ?

The next issue is our used Equipment Number
It will be especially interesting to all.
Send in your classified advertisements now.

CANADIAN MACHINERY, *143 University Ave.*
TORONTO, CANADA

SHEPARD
ELECTRIC CRANES & HOISTS

A "Shepard" aids systematic assembly

Not only in the automotive industry, but in any industry systematic assembly is essential to maximum production.

Shepard Electric Hoists, cage and floor controlled types, are playing an important part in keeping the product "on the move" in many industries.

Let Shepard Engineers work with you in planning an economical and efficient system of inter-department transportation. Their services are extended without obligation on your part.

The Shepard line includes Electric Hoists of ½ to 30 tons capacity; Electric Traveling Cranes 1 to 50 tons; and cargo handling equipment for docks and ships.

SHEPARD
Electric Crane & Hoist Co.
426 Schuyler Ave., Montour Falls, N.Y.
Canadian Representatives
RUDEL-BELNAP, Montreal
Agents in Principal Cities
Member Electric Hoist Manufacturers' Assn.

TOOL GRINDING CHART

Showing clearance and rake angles for cutting tools. 17 x 27½ inches, printed in two colors on heavy manilla stock.

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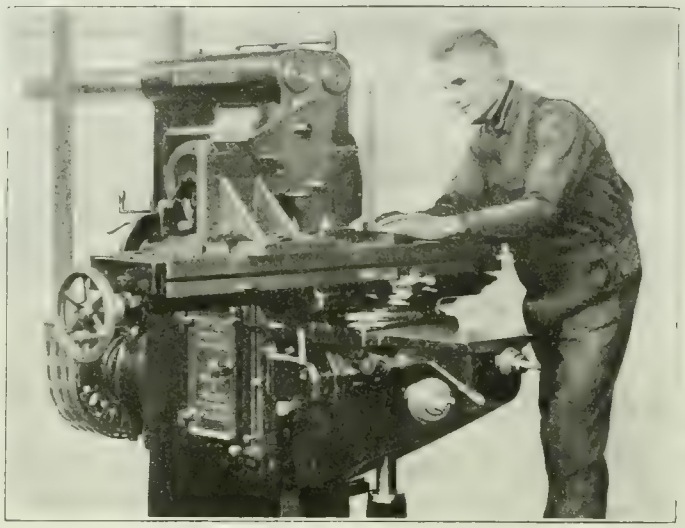

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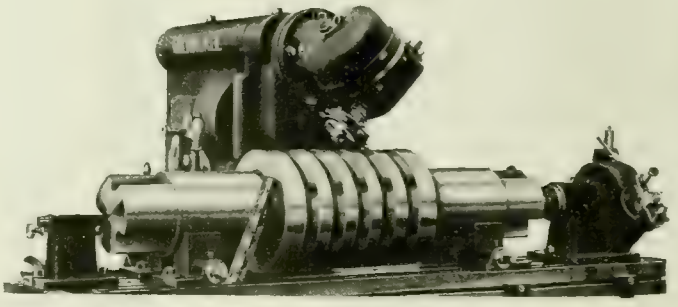

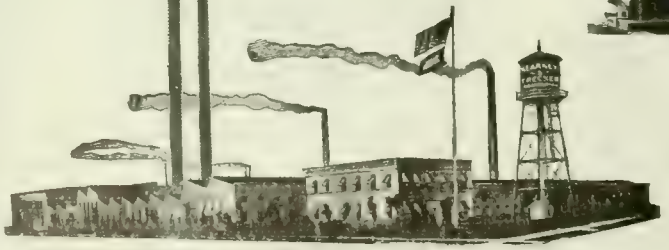

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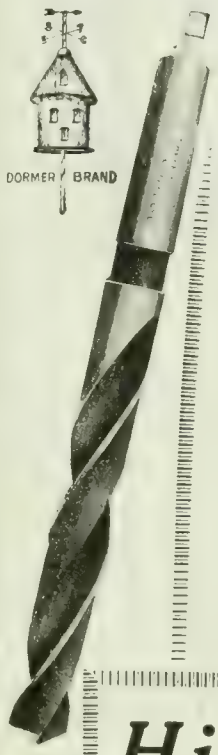

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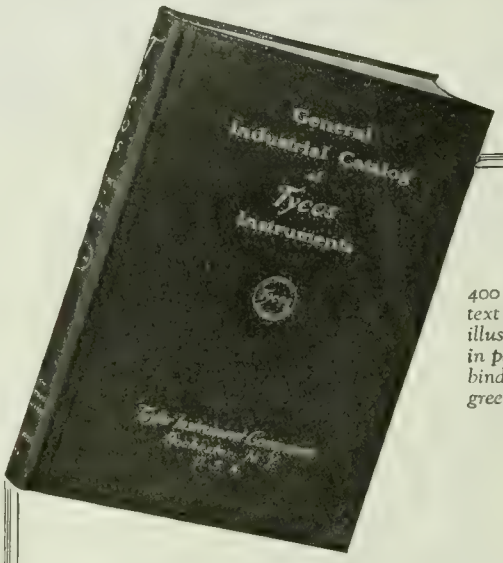

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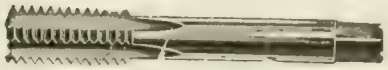

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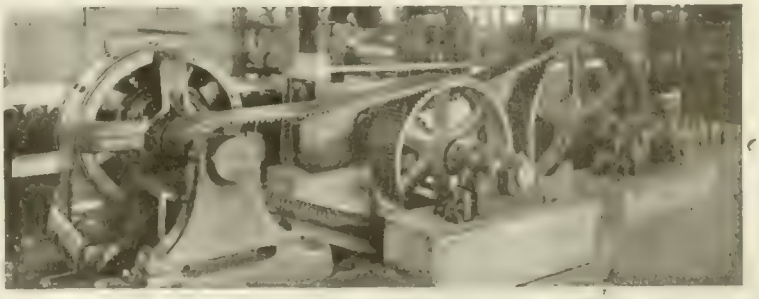

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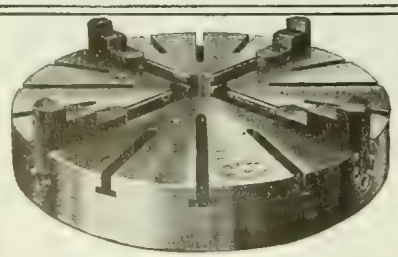

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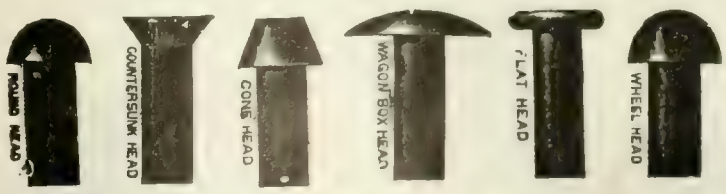

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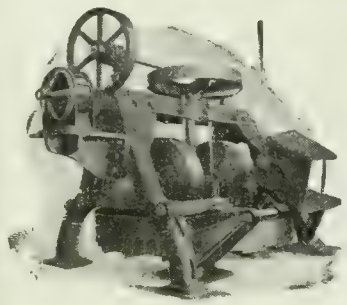

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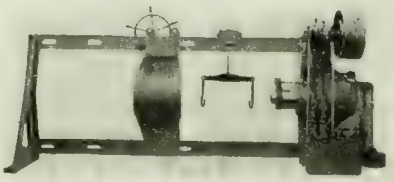

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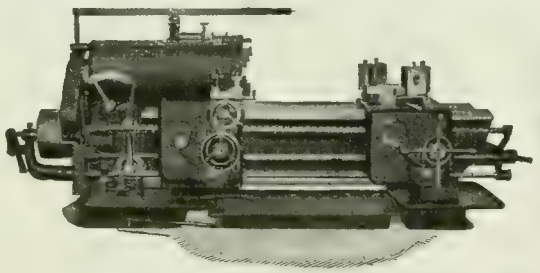

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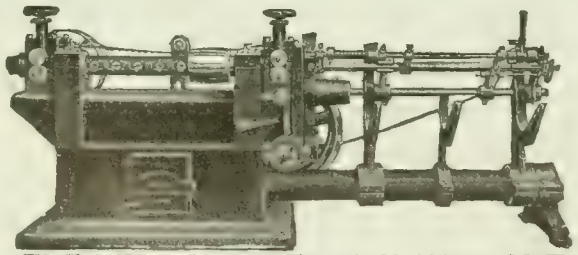

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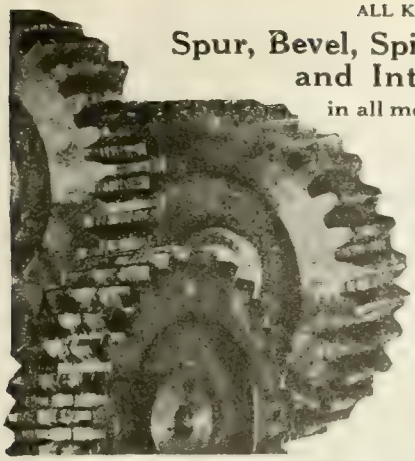

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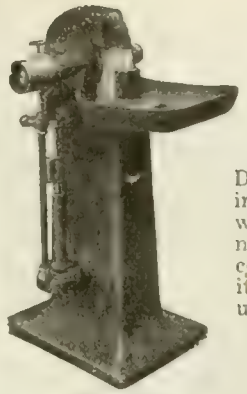

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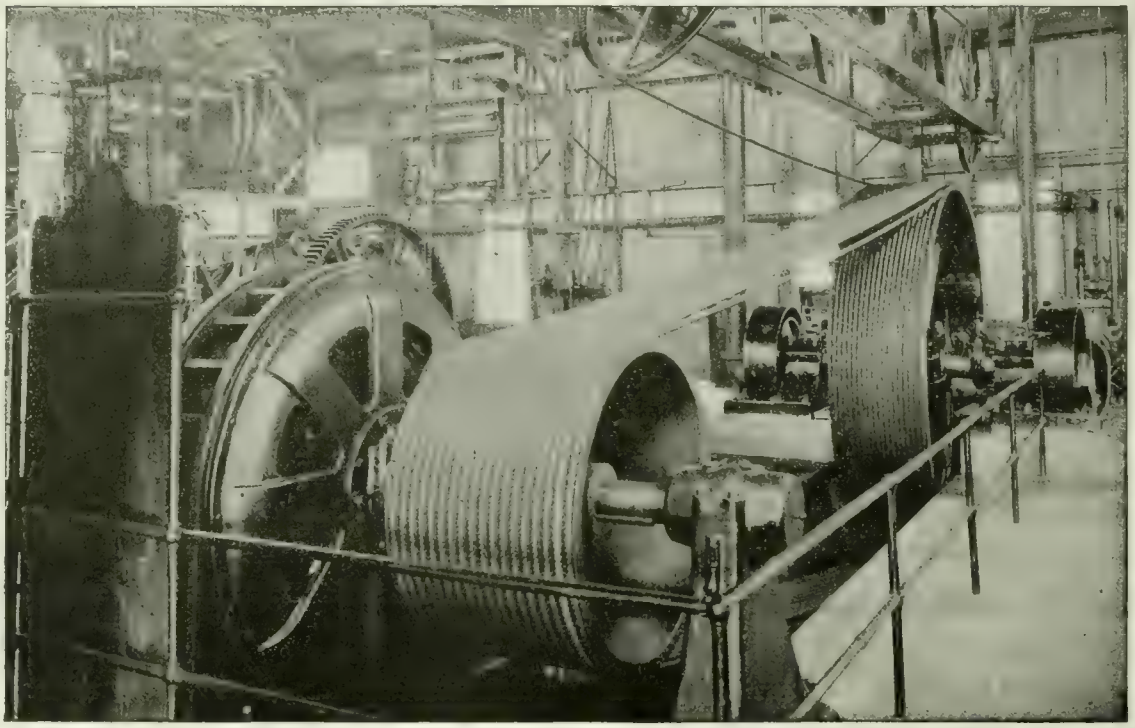

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Stewart & Co., Duncan, Glasgow, Scot.

Air Lifts
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Independent Pneumatic Tool, Chicago, Ill.

Analyses, Chemical
Toronto Testing Laboratory, Toronto, Ont.

Angle Bars
Steel Co. of Canada, Ltd., Hamilton, Ont.

Anvils
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

Arbors
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

Axles, Car
Dom. Foundries & Steel, Hamilton, Ont.

Babbitt Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.

Balls, Brass, Bronze and Steel
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Barrels, Tumbling
McDougall Co., Ltd., R., Galt, Ont.

Bars, Boring
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Madison Mfg. Co., Muskegon, Mich.

Bars, Boring, Portable
Underwood Corp., H. B., Philadelphia, Pa.

Bars, Bronze Cored
Moore & Son, Thos., Montreal, Que.

Bars, Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bars, Steel
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

Bearings, Ball
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Bronze
Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Die-Cast
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Tallman Brass & Metal Co., Hamilton, Ont.

Bearings, Journal
Fisher Motor Co., Ltd., Orillia, Ont.

Bearings, Roller
Can. Fairbanks-Morse Co., Ltd., Montreal.
Lang Mfg. Co., Guelph, Ont
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Belt Cement
McLaren Belting Co., J. C., Montreal, Que

Belt Dressings and Fillers
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

Belt Fasteners
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

For list of Dealers see the last page of This Buyers' Directory

Belt Hooks
Torrington Co., Ltd., Upper Bedford, Que.

Belt Lacing
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

Belt Lacing, Steel
Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Hinged
Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Flexible Steel
Flexible Steel Lacing Co., Chicago, Ill

Belt Lacing Machines
Clipper Belt Lacer Co., Grand Rapids, Mich
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Belt Joiners, Conveyor
Flexible Steel Lacing Co., Chicago, Ill

Belt Tools
Graton & Knight Mfg Co., Worcester, Mass

Belting, Chain
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco Montreal, Que
Lyman Tube & Supply Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Belting, Fabric
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
McLaren Belting Co., J. C., Montreal, Que
Sumner & Co., New York City

Belting, Leather
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

Belting, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

Belts, Abrasive
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

Bench Countershaft Standards
Ford-Smith Machine Co., Hamilton, Ont.

Benches, Work
Aikenhead Hardware Ltd., Toronto, Ont.

Bending Machines, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Bins, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Blocks
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Chain (See Hoists, Hand)
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Die
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

Blocks, Pillow
Can. Link-Belt Co., Toronto, Ont.

Blowers
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Sturtevant Co., B. F., Boston, Mass.

Bolt and Nut Machinery
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont
Landis Machine Co., Inc., Waynesboro, Pa
National Machinery Co., Tiffin, Ohio
Victor Tool Co., Waynesboro, Pa

Bolt and Nut Machinery, Automatic
National Acme Co., Cleveland, Ohio

Bolts and Nuts
London Bolt & Hinge Works, London, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont

Bolt Threading Die Heads
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

Boosters
Sturtevant Co., B. F., Boston, Mass.

Boring and Turning Mills, Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

Boring, Drilling and Milling Machines, Horizontal
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

Boring, Drilling and Milling Mach., Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Boring Heads
Aikenhead Hardware Ltd., Toronto, Ont.

Boring Tools
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis.

Brakes, Magnetic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Brass
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Bricks, Fire
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

Bridges
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

Broaching Machines
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.

Bronze
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Bronze, Phosphor
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont
Ontario Metal Products Co., Ltd., Toronto, Ont.

Bucket Carriers, Pivoted
Can. Link-Belt Co., Toronto, Ont.

Buffing or Polishing Machines (See Polishing and Buffing Machines)
Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.

Bulldozers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

Burners, Oil and Gas
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

Bushings
Fisher Motor Co., Ltd., Orillia, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Cabinets, Oil
S. F. Bowser & Co., Ltd., Toronto, Ont.

Calipers
Brown & Sharpe Mfg. Co., Providence, R.I.
Starrett Co., L. S., Athol, Mass.

Cams
Canada Foundries & Forgings Co., Welland, Ont.

Can-Making Machinery (See Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

Cars, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Castings, Aluminum
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Brass and Bronze
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Copper
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Marine
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Castings, Die Molded
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Ferro-Alloy
Can. Steel Foundries, Montreal, Que.

Castings, Iron
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia
Hanna & Co., M. A., Cleveland, Ohio
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Hyd. Press
Can. Steel Foundries, Montreal, Que

Castings, Monel Metal
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

Castings, Naval Bronze
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Nichrome
Can. Driver-Harris Co., Walkerville, Ont

Castings, Nickel
Can. Hanson & Van Winkle Co., Toronto, Ont.

Castings, Semi-Steel
Davidson Mfg. Co., Thos., Montreal, Que
Hull Iron & Steel Foundries, Hull, Que
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

Castings, Steel
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

Cements, Iron
Smooth Mfg. Co., Jersey City, N.J

Centering Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont

Chains (See Sprockets and Chains)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

Chains, Driving
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio

Chasers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co. Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chemists
Toronto Testing Laboratory, Toronto, Ont.

Chucking Machines
Acme Machine Tool Co., Cincinnati, Ohio.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Chucks, Drill
Jacobs Mfg. Co., Hartford, Conn.

Chucks, Drill and Tap
Aikenhead Hardware Ltd., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que

Chucks, Lathe
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Magnetic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chucks, Planer
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Chucks, Vertical Boring Mill
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Clamps, Machinists'
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill
Starrett Co., L. S., Athol, Mass.

Cleaners, Metal, Waste, General
Oakley Chemical Co., New York, N.Y

Clocks, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Clutches, Friction
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont

Coal and Ash Handling Machinery
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Coal-Storage Systems
Can. Link-Belt Co., Toronto, Ont.

Collars, Shaft or Set
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

Collets
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn
Kearney & Trecker Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Compounds, Carburizing, Case Hardening and Tempering
Cataract Refining Co., Toronto, Ont.

Compounds, Cleaning
Can. Hanson & Van Winkle Co., Ltd Toronto, Ont
Oakley Chemical Co., New York, N.Y

Compounds, Cutting, Drilling, Grinding, Screw Cutting
Atkins & Co., Inc., E. C., Indianapolis, I
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compressors, Air
Curtis Pneumatic Machinery Co., St. Louis, Mo

Compressors, Air and Gas
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Cones, Friction
Norton Co. of Can., Ltd., Hamilton, Ont.

Connecting Rods and Straps
Canada Foundries & Forgings Co., Welland, Ont.

Contract Work
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

Conveyors and Elevators (See Elevators)
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

Conveyor Belt Joiners
Flexible Steel Lacing Co., Chicago, Ill.

Copper
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Cored Bronze Bars
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Cotter Pins
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Counterbores
Cleveland Twist Drill Co., Cleveland, O
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Counters, Revolution
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Countershafts
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

Countersinks
Butterfield & Co., Inc., Rock Island, Que
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Couplers, Car and Locomotive
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont

Couplings, Flexible
Holden Co., Ltd., Montreal, Que

Couplings, Rigid
Bernard Industrial Co., A., Fortierville, Que

Couplings, Shaft
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

Cranes, Hand (See Hoists, Hand)
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Sheffield Engineering Supplies, Ltd., Montreal, Que.

Cranes, Locomotive
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Cranes, Traveling
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont

Crank Pin Turning Machines
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

Cutters, Flue
Holden Co., Ltd., Montreal, Que.

Cutters, Gear
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, High Speed
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Milling
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

Cutters, Stay Bolt
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Thread
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

Cutting-Off Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Cutting-Off Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

Cutting Oil Filters (See Oil Filtering Systems)
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

Cutting, Oxy-Acetylene
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Cutting, Oxy-Hydrogen
National Electro Products, Ltd., Toronto, Ont.

Dealers, Machinery (See Searchlight Section)
Ford-Smith Machine Co., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Deckle Straps
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Diamonds, Black and Rough
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond, Carbon and Bortz
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Desmond-Stephan Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

Diamond Crossings
Can. Steel Foundries, Montreal, Que.

Die-Castings
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Dies, Pipe-Threading
Jones & Lamson Machine Co., Springfield, Vt.

Die Sinking Machines, Automatic
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

Die Sinkers
Kimber & Hillier, St. Catharines, Ont.

Dies, Screw and Thread Cutting
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio

Dies, Sheet-Metal and Sub-Press (See Tool Work)
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

BUYERS' DIRECTORY

Dies, Forging
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

Dies, Hammer
Kimber & Hillier, St. Catharines, Ont.

Dies, Self-Opening, Adjustable
Can Fairbanks-Morse Co., Ltd., Montreal
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Disc Cement
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill

Dividing Heads
Ackworthle, Ltd., John, Birmingham, Eng
Dickow, Fred C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co Hamilton, Ont
Hendey Machine Co., Torrington, Conn
Kearney & Trecker Co., Milwaukee, Wis
Petrie, Ltd., H. W., Toronto, Ont

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago, Ill.

Drafting Boards and Tables
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que

Drafting Materials
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Dressers, Grinding Wheel
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich

Drill Holders
Armstrong Bros. Tool Co., Chicago, Ill

Drill Rods
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drill Speeders
Canada Machinery Corp., Galt, Ont.

Drilling Machine Heads
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

Drilling Machines, Automatic
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Bench
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis

Drilling Machines, Electric and Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo F., Montreal Que.
Garlock-Walker Mchy Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont
Wisconsin Electric Co., Racine, Wis

Drilling Machines, Gang
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drilling Machines, Heavy Duty
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Multiple Spindle
Beacon Engineering Co., Tipton, England
Bertram & Son Co., Ltd., The John Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

Drilling Machines, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool Chicago Ill

Drilling Machines, Portable
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool Chicago Ill
Jardine & Co., A. B., Hespeler, Ont
Wisconsin Electric Co., Racine, Wis

Drilling Machines, Radial
Bertram & Son Co., Ltd., The John Dundas, Ont
Canada Machinery Corp., Galt, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Henry & Wright Mfg Co., Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont
Petrie, Ltd., H. W., Toronto, Ont
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Drilling Machines, Sensitive
Beacon Engineering Co., Tipton, England
Bilton Machine Co., Bridgeport, Conn
Henry & Wright Mfg Co., Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto Ont.
Wisconsin Electric Co., Racine, Wis

Drilling Machines, Turret
Gisholt Machine Co., Madison Wis
Steinle Turret Machine Co., Madison Wis
Williams Machinery Co., A. R., Toronto Ont.

Drilling Machines, Vertical
Aurora Tool Works, Aurora, Ind
Bertram & Son Co., Ltd., The John, Dundas Ont
Canada Machinery Corp., Galt, Ont
Can Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind
McDougall Co., Ltd., R., Galt, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng
Streiffinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Drills, Center
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drills, High Speed Twist
Armstrong Whitworth Co of Can., Ltd Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Drills, Twist and Flat
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

Dust Handling Equipment
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros Mfg Co., Inc., St. Louis Mo
Sturtevant Co., B. F., Boston, Mass

Electrical Instruments
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que

Electrical Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont
Northern Electric Co., Montreal, Que
U S. Electrical Tool Co., Cincinnati, O

Elevating Trucks (See Trucks)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Elevators and Conveyors
Can. Link-Belt Co., Toronto, Ont
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

Emery Wheels (See Grinding Wheels)
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont
Waltham Grinding Wheel Co. of Canada Ltd., Brantford, Ont

Engines, Capstan
Kennedy & Sons, Wm., Owen Sound, Ont

Engineers, Mechanical
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis
Hamilton Gear & Machine Co., Toronto, Ont
Perdue, W. B., San Francisco, Calif

Expanders, Tube
Garlock-Walker Mchy Co Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Eyeglasses, Safety (See Goggles, Safety)
Prest-O-Lite Co of Can., Toronto, Ont
Willson Goggles, Inc., Reading, Pa.

Fans, Electric
Can Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis Mo.
Sturtevant Co., B. F., Boston, Mass

Fans, Exhaust
Can Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros Mfg Co., Inc., St. Louis Mo
Sturtevant Co., B. F., Boston, Mass.

Fans, Ventilating
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont
Skinner Bros Mfg Co., Inc., St. Louis Mo
Sturtevant Co., B. F., Boston, Mass

Fibre
Diamond State Fibre Co of Can., Ltd Toronto, Ont.
Northern Electric Co., Montreal, Que.

File Handles
Ingersoll File Co., Ltd., Ingersoll Ont

Files and Rasps
Atkins & Co., Inc., E. C., Indianapolis, I
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont
Simonds Canada Saw Co., Montreal, Que

Filing Machines
Garlock-Walker Mchy Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich
Williams Machinery & Supply Co., A. R., Montreal Que

Filler, Iron (See Cements, Iron)
Smooth Mfg. Co., Jersey City, N.J.

Fire Extinguishers
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Fittings, Pipe
International Malleable Iron Co., Guelph, Ont.

Flexible Shafts
Aikenhead Hardware Ltd., Toronto, Ont

Flux, Galvanizing
British Smelting & Refining Co., Ltd., Montreal, Que.

Fluxes, Welding
L'Air Liquide Society, Toronto, Ont.

Forging Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

Forgings, Drop
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd Toronto, Ont.

Forgings, Hammer
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Foundry Equipment
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Foundry Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Frogs, Spring or Rigid
Can. Steel Foundries, Montreal, Que.

Fuel Oil Burning System
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Heat Treating Coal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

Furnaces, Heat Treating Oil and Gas
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont

Furnaces and Ovens, Electric
Electric Furnace Construction Co., Philadelphia, Pa
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

Furnaces, Tempering and Annealing
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furniture, Machine Shop
Garlock-Walker Mchy. Co., Toronto, Ont.

Gages, Comparator
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont
Johansson Inc., C. E., Windsor, Ont
Perdue, W. B., San Francisco, Calif
Starrett Co., L. S., Athol, Mass

Gages, Measuring (See Tool Work)
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

Gages, Recording
Bristol Co., Waterbury, Conn.
Johanson Inc., C. E., Windsor, Ont

BUYERS' DIRECTORY

Gages, Snap, Thread and Cylindrical
Ackworthie, Ltd., John, Birmingham, Eng.
Brown & Sharpe Mfg. Co., Providence, R I
Can. Fairbanks-Morse Co., Ltd., Montreal
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Special Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Standard
Armstrong Whitworth Co. of Can., Ltd. Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis, Johansson Inc., C. E., Windsor, Ont.

Gages, Thread
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co., Toronto, Ont.

Gas, Coal Compressed
L'Air Liquide Society, Toronto, Ont.

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

Gear Blanks
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

Gear-Cutting Machines
Bertram & Son Co., Ltd, The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.

Gears, Cast
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Gears, Dressed
Kennedy & Sons, Wm., Owen Sound, Ont.

Gears, Forged
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

Gears, Machine Moulded
Can. Steel Foundries, Montreal, Que.

Gears, Rawhide (See Gears, Cut)
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa

Gear, Silent Chain
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

Gears, Worm
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

Generators, Acetylene
L'Air Liquide Society, Toronto, Ont.

Generators, Electric
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Goggles, Safety
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

Grab Buckets
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Grease Cups, Pressed Steel and Brass
Can. Winkley Co., Ltd, Windsor, Ont.

Greases, Lubricating
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

Grinding Discs
Ritchey Supply Co., Toronto, Ont.

Grinding Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

Grinding Machines, Abrasive Belt
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Bench
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

Grinding Machines, Center
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines Chaser
Jones & Lamson Machine Co., Springfield, Vt.

Grinding Machines, Cutter and Reamer
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Cylindrical
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Die
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

Grinding Machines, Disc
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Drill
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Face
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Floor and Tool
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Grinding Machines, Internal
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Portable
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Power Oscillating Tool
Herbert Ltd., Alfred, Toronto, Ont.

Grinding Machines, Ring Wheel
Ford-Smith Machine Co., Hamilton, Ont

Grinding Machines, Snagging
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Surface
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machinery, Tool Post
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

Grinding Wheels
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

Guards, Emery Wheel
Ford-Smith Machine Co., Hamilton, Ont

Guards, Machinery and Window
Can. Wire & Iron Goods Co., Hamilton, Ont.

Guards, Electric Lamp
Flexible Steel Lacing Co., Chicago, Ill.

Gun-Barrel Machinery
Steinle Turret Machine Co., Madison, Wis.

Hack Saws, Power
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Toronto, Ont.

Hammers, Drop
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Aikenhead Hardware Ltd., Toronto, Ont
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Hammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Hammers, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hammers, Riveting
Cleveland Pneumatic Tool Co., Toronto, Ont.

Hangers, Shafting
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hardening, Case-Hardening and Tempering
Hamilton Gear & Machine Co., Toronto, Ont.

Hardness Testing Apparatus
Shore Instrument Co., Jamaica, N.Y.

Heating
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

Hobbing Machines
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hobs
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Hoists, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

Hoists, Hand
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Hoists, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, Flexible Steel
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Hose, Industrial
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Hose, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester, Mass.

Hydraulic Machinery
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

Hydrogen
National Electro Products, Ltd., Toronto, Ont.

Index Centers
Dickow, Fred. C., Machinery Co., Chicago, Ill.

Igniters, Gas Engine
Canada Foundries & Forgings Co., Welland, Ont.

Indicators, Speed and Test
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

Insulation
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Jacks, Hydraulic
Norton, A. O., Boston, Mass.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

BUYERS' DIRECTORY

Jigs and Fixtures (See Tool Work)
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Keyseating Machines
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Keys, Machine
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

Knives, Machine
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

Knurl Holders
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lacing Leather
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

Lamps, Electric
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

Lathe Attachments
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

Lathe Pans, Portable
Canada Machinery Corp., Galt, Ont.

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

Lathes, Automatic and Semi-Automatic
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Bench
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lathes, Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Engine
Archibald & Co., Chas. P., Montreal, Q
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Extension and Gap
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Lathes, Heavy Duty Projectile Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blashill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio.
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Polishing (See Polishing and Buffing Machines)
Ford-Smith Machine Co., Hamilton, Ont.

Lathes, Relieving
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

Lathe, Universal Hand
Brown & Sharpe Mfg. Co., Providence, R.I.

Lathes, Screw-Cutting
Jones & Lamson Machine Co., Springfield, Vt.

Lathe, Speed and Hand
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

Lathes, Spinning
Terry & Co., John C., Birmingham, Eng.

Lathes, Threading
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

Lathes, Vertical Turret
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

Lathes, Wood Turning
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Lead Pipe
Steel Co. of Canada, Ltd., Hamilton, Ont.

Lighting Fixtures
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

Linoleum Mill Machinery
Bertrams Ltd., Edinburgh, Scotland.

Liquid Air Plants
L'Air Liquide Society, Toronto, Ont.

Lockers, Clothes
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Lubricants
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Lubricating Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Machinists' Small Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Manganese Steel
Can. Steel Foundries, Montreal, Que.

Mandrels, Expanding
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Mandrels, Solid
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Measuring Machines
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Metals, Alloy
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Metalite Cloth
Ritchey Supply Co., Toronto, Ont.

Micrometer Calipers
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Milling Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

Milling Machines, Automatic
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Bench
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Hand
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Horizontal and Planer Type
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Milling Machines, Plain
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Milling Machines, Universal
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

Milling Machines, Vertical
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

Monel Metal
International Nickel Co. of Can., Ltd., Toronto, Ont.

Motors, Electric
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Moulded Rubber Goods
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Nail Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Nails and Staples
Steel Co. of Canada, Ltd., Hamilton, Ont.

Nickel, Bars, Sheets, Wire, Etc.
International Nickel Co. of Can., Ltd., Toronto, Ont.

Nickel Plating Outfits
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Nickel Silver
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Nitrogen
L'Air Liquide Society, Toronto, Ont.

Nut Tappers (See Bolt and Nut Machinery)
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished
Galt Machine Screw Co., Galt, Ont.

Nuts, Machine Screw
Torrington Company, Ltd., Upper Bedford, Que.

Nuts, S.A.E., Plain and Castellated
Galt Machine Screw Co., Galt, Ont.

Oil Filtering and Storage Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oil Storage Engineers
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oils
Canadian Oil Companies, Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers
Can. Winkley Co., Ltd., Windsor, Ont.

Oils, Soluble
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oxygen
Carter Welding Co., Toronto, Ont
Dominion Oxygen Co., Toronto, Ont
L'Air Liquide Society, Toronto, Ont.

Oxy-Acetylene Apparatus
L'Air Liquide Society, Toronto, Ont.

Packing, Hydraulic
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

Packing, Steam
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

Paper Mill Conveyors
Bertrams Ltd., Edinburgh, Scotland.

Patents
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

Pans, Wet and Dry
Frost Mfg. Co., Chicago, Ill.

Pattern-Shop Machinery (See Woodworking Machinery)
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Patterns, Wood and Metal
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

Penstocks, Steel
MacKinnon Steel Co., Sherbrooke, Que

BUYERS' DIRECTORY

Phosphor Tin
British Smelting & Refining Co., Ltd., Montreal, Que.

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pig Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Bending Machines
American Pipe Bending Machine Co., Boston, Mass
Can. Fairbanks-Morse Co., Ltd., Montreal
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Pipe Couplings
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Cutting and Threading Machines
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa.

Piston-Ring Machines
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg. Co., Niagara Falls, Ont.

Planing Machines
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Pneumatic Tools
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Polishing and Buffing Machines
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Pots, Steel
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

Pressed Steel Parts
Ackworthie, Ltd., John, Birmingham, Eng
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal.
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

Presses, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Screw
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Protractors
Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers
Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

Pulleys, Metal and Fibre
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Pulp and Paper Mill Equipment
MacKinnon Steel Co., Sherbrooke, Que.

Pumps, Automobile Tire
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Pumps, Barrel and Boiler-feed
Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coolant
Trahern Pump Co., Rockford, Ill.

Pumps, Geared and Hand
Trahern Pump Co., Rockford, Ill.

Pumps, Industrial
Trahern Pump Co., Rockford, Ill.

Pumps, Hydraulic
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

Pumps, Power
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

Punches, Center
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

Punches, Power
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

Punching Machines, Horizontal
Bertrams Ltd., Edinburgh, Scotland.

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Racks, Cut
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

Racks, Storage (See Furniture, Machine Shop)
Brantford Oven & Rack Co., Brantford, Ont.

Rammers, Foundry
Holden Co., Ltd., Montreal, Que.

Reamer Holders
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

Reamers, Expanding
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Reamers, Solid
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Reamers, Taper
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Recorders, Temperature
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Recorders, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Regulators, Automatic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Rheostats
Northern Electric Co., Montreal, Que.

Resistance Materials
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Respirators
Willson Goggles, Inc., Reading, Pa.

Rivets
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

Rivet Heaters
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

Riveting Machines
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment
Stewart & Co., Duncan, Glasgow, Scot.

Rolls (Rubber Covered)
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Rudder Frames, Steel
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Rubber Goods, Mechanical
Quaker City Rubber Co., Philadelphia, Pa.

Rules, Steel
Chesterman & Co., Ltd., J., Sheffield, Eng.

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence, R.I.

Rust Preventatives
Oakley Chemical Co., New York, N.Y.

Sand Equipment
Can. Link-Belt Co., Toronto, Ont

Sand Mills
Frost Mfg. Co. Chicago, Ill.

Sanding Machinery
Oliver Machy. Co., Grand Rapids, Mich.

Sand Rammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Saw Frames and Blades, Hack
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

Sawing Machines, Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Sawing Machines, Power Hack
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Saw Sharpening Machines
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saw Tables, Universal
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Saws, Circular Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

Saws, Hot and Cold
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Saws, High Speed Steel
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Metal Band
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saws, Metal, Power
Clemson Bros., Inc., Hamilton, Ont.

Saws, Metal Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

Saws, Milling
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Saws, Screw Slotting
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Swing Cut-off
Oliver Machinery Co., Grand Rapids, Mich.

Scales
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal. Q.

Screens
Can. Wire & Iron Goods Co., Hamilton, Ont.

Screw Drivers, Optical, Jewelry and Novelty
Torrington Co., Ltd., Upper Bedford, Que.

Screw Driving Machine
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Screw Extractors
Cleveland Twist Drill Co., Cleveland, O.

Screw Machine Work
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

BUYERS' DIRECTORY

Screw Machinery, Wood and Lag
Cook Co., Asa S., Hartford, Conn

Screw Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Screw Machines, Automatic
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati, Ohio
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio

Screw Machine Products
Torrington Company, Ltd., Upper Bedford, Que

Screw Plates
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Screws, Cap and Set
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Lock Cap
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Machine
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Safety Set
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Screws, Side Knob
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Thumb
Torrington Company, Ltd., Upper Bedford, Que.

Second-Hand Machinery
(See Searchlight Section)
Petrie, Ltd., H. W., Toronto, Ont.

Separators, Moisture and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Separators, Oil and Waste
Bowser, S. F., & Co., Ltd., Toronto, Can.

Shafting
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont.

Shaping Machines
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Shapers, Wood
Oliver Machinery Co., Grand Rapids, Mich.

Shears, Hand
Can. Blower & Forge Co., Ltd., Kitchener.

Shears, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio
Williams Machinery Co., A. R., Toronto, Ont.

Shearing Machines, Angle, Iron Bar and Gate
Bertrams Ltd., Edinburgh, Scotland

Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio

Sheets, Nickel, Resist, Alloy
International Nickel Co. of Can., Ltd., Toronto, Ont.

Sheets, Nickel, Monel and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Side Frames, Locomotive
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Slotting Attachments
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

Slotting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

Solders
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

Snap Flasks
Oliver Machy. Co., Grand Rapids, Mich

Special Machinery and Tools
Brown Engineering Corp., Ltd., Toronto
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Specialties, Swaged and Headed Work
Torrington Company, Ltd., Upper Bedford, Que.

Spectacles, Industrial
Willson Goggles, Inc., Reading, Pa.

Springs
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont

Spring-making Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Sprockets and Chains
Can. Link-Belt Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Squares
Brown & Sharpe Mfg Co., Providence, R.I

Stamping, Metal
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
Diamond Saw & Stamping Works, Buffalo, N.Y.

Stairways, Wrought Iron
Can. Wire & Iron Goods Co., Hamilton, Ont.

Steam Specialties
Crane Ltd., Montreal, Que.

Steel Plate
Dom. Foundries & Steel, Hamilton, Ont

Steels, Tool
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa

Steel Blooms and Billets
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steel, Cold-Rolled Strip
Andrews Steel Co., Newport, Ky
Barnes Co., Wallace, Bristol, Conn
Can. Driver-Harris Co., Walkerville, Ont
Firth & Sons, Ltd., Thos., Montreal, Q
Ontario Metal Products Co., Ltd., Toronto, Ont

Steel Castings
Dom. Foundries & Steel, Hamilton, Ont

Steel Forgings
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Steel, Shafting and Free Cutting Screw
Barnes Co., Wallace, Bristol, Conn
Can. Drawn Steel Co., Hamilton, Ont
Union Drawn Steel Co., Hamilton, Ont.

Steel, Sheet
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont
Toronto Iron Works, Toronto, Ont

Steel, Tanks
Can. John Wood Mfg. Co., Toronto, Ont.

Steel, Stainless
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel Wire Rods
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steels, Alloy, Open Hearth and Electric
United Alloy Steel Corp., Canton, Ohio.

Steels, Alloy and Carbon
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steels, High-Speed
Armstrong Bros. Tool Co., Chicago, Ill
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel, Magnet
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel, Structural
MacKinnon Steel Co., Sherbrooke, Que.

Steel Tubing, Close Joint and Welded
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

Stern Frames, Cast Steel
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Straightening Machinery
Bertrams Ltd., Edinburgh, Scotland.

Studs
Galt Machine Screw Co., Galt, Ont.

Surface Plates
Bilton Machine Co., Bridgeport, Conn.

Swaging Machines
Atkins & Co., Inc., E. C., Indianapolis, I

Switches, Railway
Can. Steel Foundries, Montreal, Que.

Switches and Switchboards
Northern Electric Co., Montreal, Que.

Tablets, Bronze, Memorial
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Tachometers
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

Tanks, Steel
MacKinnon Steel Co., Sherbrooke, Que

Tanks and Pumps, Oil
Bowser, S. F., & Co., Ltd., Toronto, Can
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

Taper Cutting Dies
Jones & Lamson Machine Co., Springfield, Vt

Tap Holders
Greenfield Tap & Die Corp., Galt, Ont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taper Pins
Galt Machine Screw Co., Galt, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Tapes, Measuring
Chesterman & Co., Ltd., J., Sheffield, Eng
Starrett Co., L. S., Athol, Mass

Tapping Machines and Attachments
Ackworthle, Ltd., John, Birmingham, Eng
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont
National Acme Co., Cleveland, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass

Taps and Dies
Ackworthle, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taps, Collapsing
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

Teeth, Dredge Bucket
Kennedy & Sons, Wm., Owen Sound, Ont.

Testing Metals and Materials
Toronto Testing Laboratory, Toronto, Ont.

Thermometers
Bristol Co., Waterbury, Conn.

Thread-Cutting Tools
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Thread Cutting Machines
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

Threaded Wires
Torrington Company, Ltd., Upper Bedford, Que.

Threading Machines
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Thread Lead Testing Machines
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Thread-Rolling Machines
Bliss Co., E. W., Brooklyn, N.Y.

Tongs
Hepburn Ltd., John T., Toronto, Ont.

Tool Cases
Rice Lewis & Son, Ltd., Toronto, Ont.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill
Bilton Machine Co., Bridgeport, Conn
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Markers, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Tool Posts, Lathe
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Steels for all Purposes
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Tools, Small (See Machinists' Small Tools)
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Armstrong Bros. Tool Co., Chicago, Ill
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Kimber & Hillier Mfg. Co., St. Catharines, Ont
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Starrett Co., L. S., Athol, Mass
Strelinger Co. of Can., Ltd., Chas. A. Windsor, Ont.
Wheel Truing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Tool Work
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont

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Torches, Blow
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Trackwork, Railway
Can. Steel Foundries, Montreal, Que.

Trackwork, Manganese Steel
Can. Steel Foundries, Montreal, Que.

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Northern Electric Co., Montreal, Que.

Transmission Machinery
Bernard Industrial Co., A., Fortierville Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

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Mathews Gravity Carrier Co., Port Hope, Ont.

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Can. Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.

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Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

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Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

Trucks, Industrial Motor
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

Tube, Products
Tube Co. of Canada, Toronto, Ont.

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Tube Co. of Canada, Toronto, Ont.

Tubing, Flexible
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Tubing, Seamless Steel
Tube Co. of Canada, Toronto, Ont.

Tubing, Seamless Steel, Brass and Copper and Fibre
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Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

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International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Tubing, Welded Steel
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Bertram & Son Co., Ltd., The John, Dundas, Ont.

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Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Turrets, Tool Post
Gisholt Machine Co., Madison, Wis.

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Holden Co., Ltd., Montreal, Que.

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Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
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Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

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Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

Vises, Metal Workers'
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

Vises, Milling Machine
Brown & Sharpe Mfg. Co., Providence, R I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
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Kempsmith Mfg. Co., Milwaukee, Wis.
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Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
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Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
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Prest-O-Lite Co. of Can., Toronto, Ont.

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Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

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Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

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Volta Mfg. Co., Welland, Ont.

Winches, Headgate
Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Stoplog
Kennedy & Sons, Wm., Owen Sound, Ont.

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Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
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Schuster Co., F. B., New Haven, Conn.
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L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

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Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

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Canada Machinery Corp., Galt, Ont.
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Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

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Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Machinists'
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Pipe
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

Wrenches, Tap
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont

Wrought Iron Pipe
Steel Co. of Canada, Ltd., Hamilton, Ont.

DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que.
The Canadian Fairbanks-Morse Co., Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
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H. W. Petrie Limited, Toronto, Ont
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
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A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

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The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada, Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

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H. W. Petrie Limited, Toronto, Ont.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Yeates Machinery Co., London, Ont

Vises, Pipe
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

Vises, Planer and Shaper
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

Vises, Wood Workers'
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich.

Washers, Rubber
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Welding Apparatus, Oxy-Acetylene
L'Air Liquide Society, Toronto, Ont.

Welding, Electric
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

Welding Filler Rods
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

CANADIAN MACHINERY AND MANUFACTURING NEWS
143 UNIVERSITY AVE., TORONTO, CANADA

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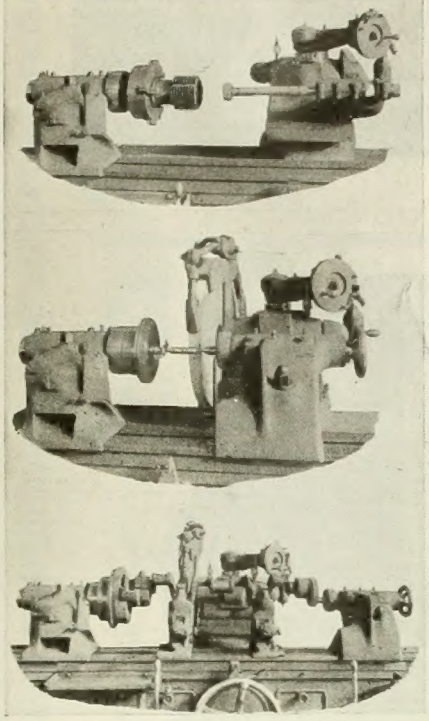

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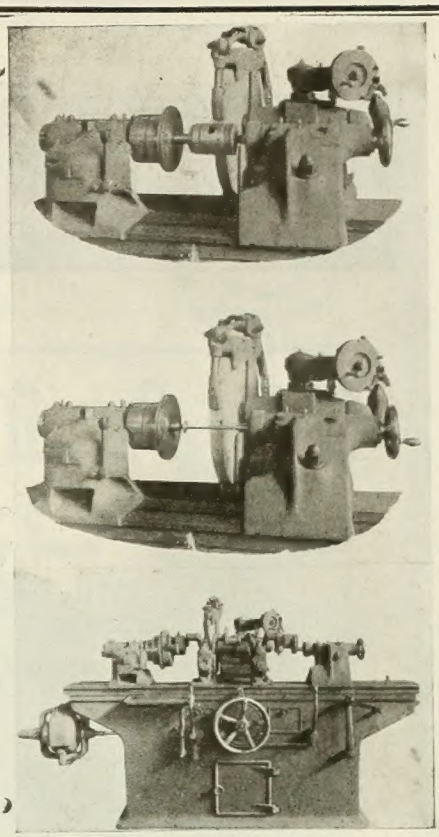

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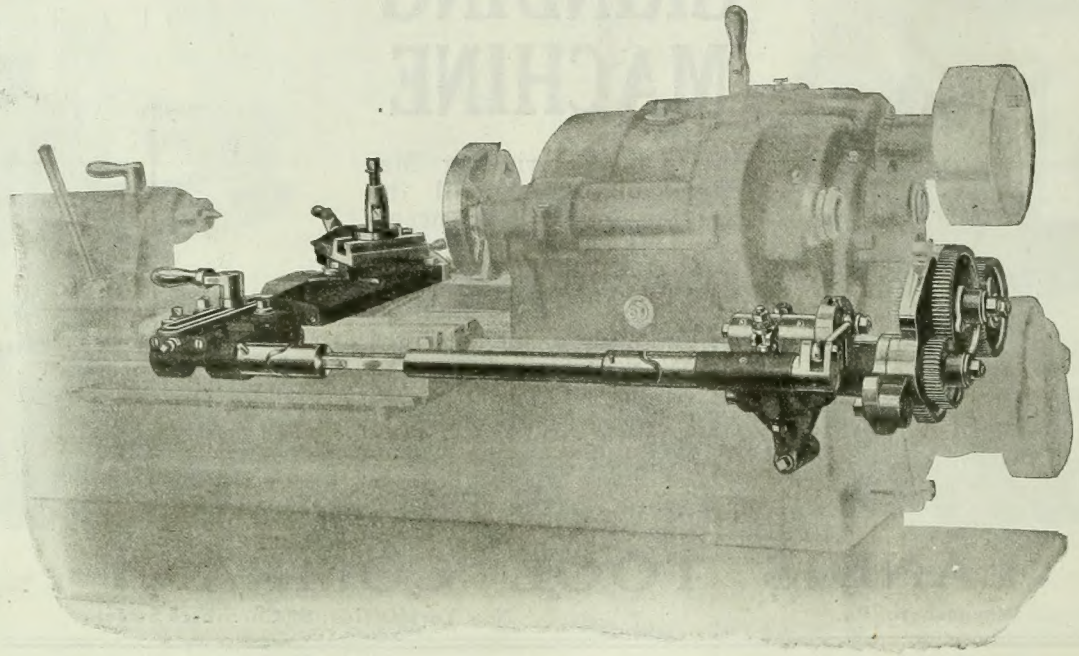

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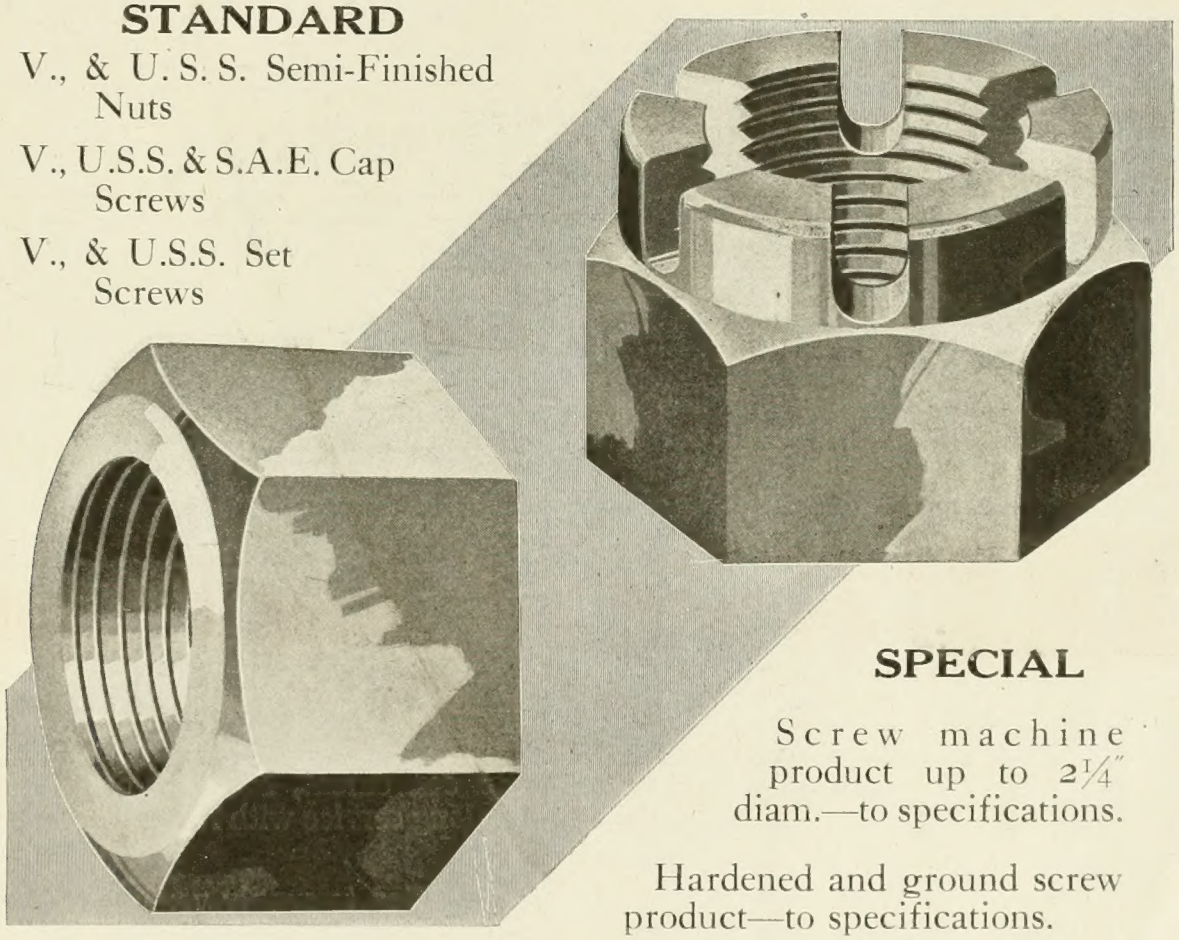

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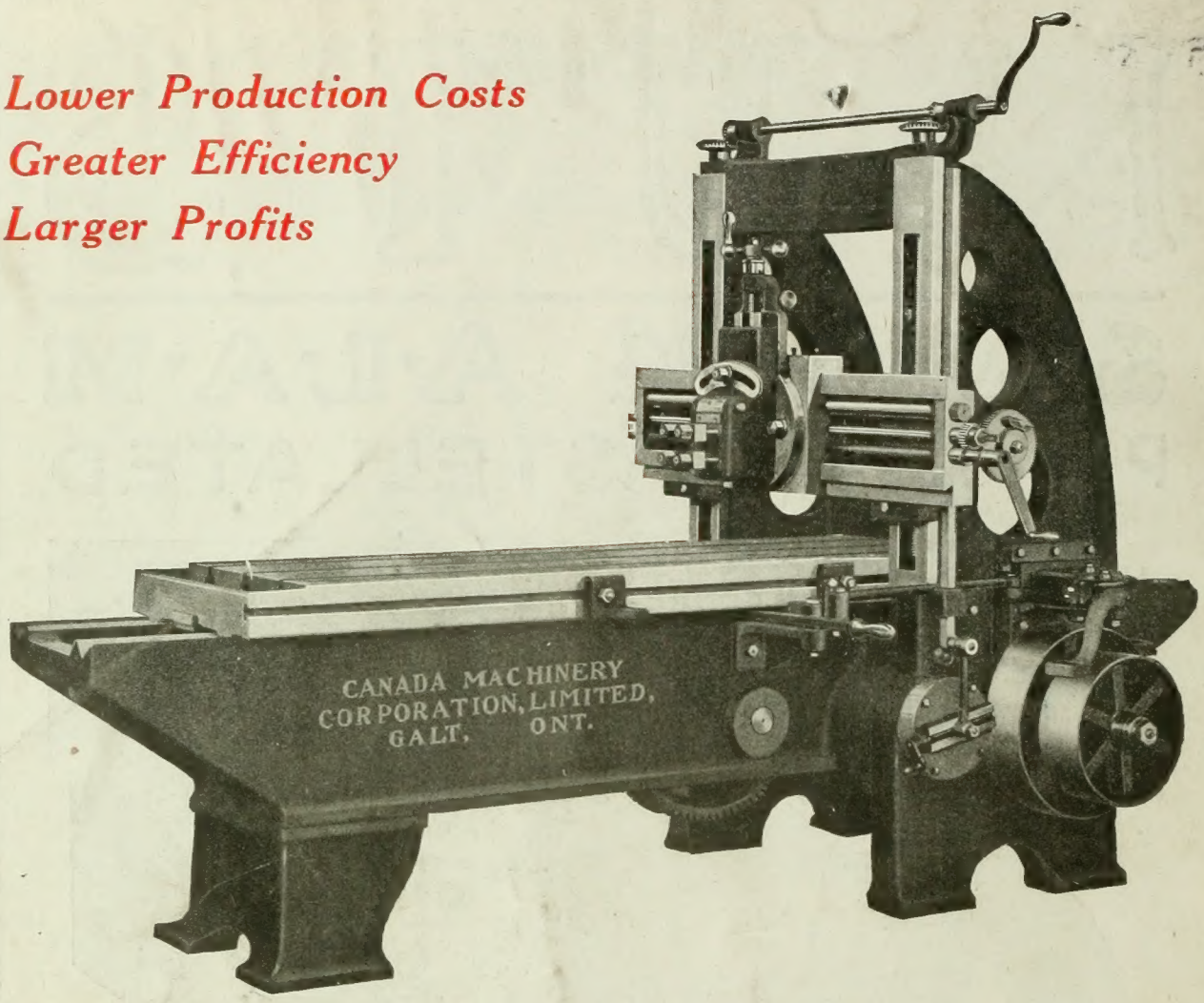

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